

DIETARY GUIDELINES FOR INDIANS

- A Manual

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80 Years
1918-1998

NATIONAL INSTITUTE OF NUTRITION
Indian Council of Medical Research
Hyderabad-500 007, India

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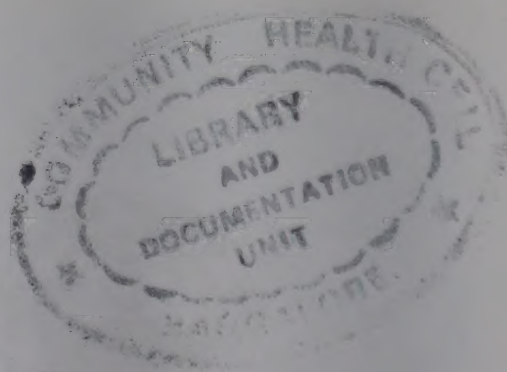


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अन्नपते न्नस्यनोदेहि अनमीवस्य शुष्मिणः।

-यजुर्वेद

गुणास्तु षष्मिन्न भुबलं भजन्ने अरोग्यं आयुः
प्रतिभाबलंच अनाविलं चास्य भवेदपत्यम्
नचैनमन्याश इतिक्षिपन्ति।

-महाभारते

*Oh, God, Give us food which does not cause any
disease and also gives us strength.*

- Yajurveda

*He, who takes food in proper measure lives a long life
and lives without disease, gets strength and alertness of mind.
However, his children are born healthy and without any
deformity or disease.*

- Mahabharatha

FOREWORD

India's population may well exceed one billion within the next decade. It is, often, the quantitative, rather than the qualitative aspect of the "population problem" that gets the major attention. A truly meaningful population policy must, however, address both these interdependent dimensions. While we must do everything possible to regulate and retard population growth, we must also ensure the quality of our human resources. With a healthy and productive population, India could become one of the mightiest countries of the world in the next century.

Good nutrition is the fundamental basic requirement for positive health, functional efficiency and productivity. Nutrition science provides abundant evidence of the importance of nutrition in not only promoting proper physical growth and development, but also in ensuring adequate immunocompetence, and cognitive development. Recent advances point to the far-reaching effects of good nutrition in early life (intra-uterine, infancy and childhood) on prevention of degenerative diseases in late adult life. For a Nation to be healthy, strong and productive, the nutritional status of its people must be good.

Good nutritional status is achieved not through drugs, tablets and pills but through well-balanced diets. There is no known nutritional deficiency disorder that cannot be prevented by proper diet. It has become necessary to emphasize this obvious fact because, in recent years, commercially motivated propaganda has tended to promote the use of synthetic nutrients as the answer to the nutritional problems of developing countries. While the common man must be provided adequate information as to how his nutritional needs can be fully met through the judicious use of foods available at his own doorstep, the affluent sections need to be informed of the deleterious effects of dietary excesses and errors and as to how these can be avoided. We are, today, carrying the double burden of nutritional deficiencies among the poor sections of the population on the one hand and such problems as overweight and obesity among the affluent sections attributable to wrong diets and unhealthy life-styles, on the other.

India has been generously endowed with abundant land and water resources and rich biodiversity. A whole range of foods which can provide balanced nutritious diets are available within the country. Our agricultural scientists are alive to the need for augmenting and diversifying food production in our country. Prudence demands that we use our plentiful food resources wisely for the promotion of the health of our people.

We have, today, a fair knowledge of the nutritive value of different foods available within the country. We also have a good understanding of the requirements of different nutrients for the maintenance of proper health and prevention of diseases. These data, of course, have to be continuously updated in the light of the latest advances in Nutrition Science. The Indian Council of Medical Research and the National Institute of Nutrition have made (and doubtless will continue to make) major contributions towards gathering and disseminating this information. Of real practical importance, however, are the dietary guidelines that emerge from such scientific data.

It is these Dietary Guidelines that provide information as to the actual diets that need to be consumed in order to ensure optimal health in different physiological states and in different age groups; diets based on locally available foods within the reach of the people and generally in conformity with their traditions and customs. The present publication seeks to present such Dietary Guidelines for the people of this country.

As was pointed out earlier, Dietary Guidelines are important to the common man in order to enable him to make the right choice of foods available to him, for ensuring optimal health and freedom from disease for his family. They are also important for the affluent sections of the population in order to enable them to avoid possible ill-health attributable to dietary excesses and errors. These Dietary Guidelines must become an important part of health education to be beamed to the public through the Media.

Today, there is increasing public awareness of the importance of diet for the maintenance and promotion of health. But in order that this 'awareness' is not misused to spread misinformation and for commercial exploitation, it is important that authentic information based on scientific data is made available to the public. It is hoped that this valuable publication will be widely used to promote healthful dietary habits among our people. If so used this publication could well become a major contribution towards the promotion of health and well being of our Nation.

C. Gopalan

President

Nutrition Foundation of India

and

Former Director-General

Indian Council of Medical Research

New Delhi,
May, 1998.

PREFACE

Maintenance of optimal nutrition and positive health of the population through assured nutrient intake continues to be a national priority. The National Institute of Nutrition, a premier institute of the Indian Council of Medical Research, has been formulating strategies for promoting nutrition, based on its research findings for the last eight decades. One of its major activities is to disseminate scientific information on food and nutrition in simple language for the common man. This book meets the long-felt need on the subject of food based dietary guidelines.

The overall objective of the manual is to translate the nutrient-based recommended dietary allowances into diet or food based guidelines. The dietary goals and guidelines proposed are based on the major public health issues in the country. The guidelines also emphasize use of appropriate diets for the emerging problem of diet-related chronic diseases. Scientific basis for each of these guidelines has been elaborated in sections with appropriate positive messages for the general public. The publication provides information on ideal body weight, recommended dietary allowances, food groups, portion sizes and diets (menu plan) to be consumed by people of various age groups and the pregnant and lactating women. The information provided covers several issues ranging from a wide range of dietary patterns that are nutritionally adequate to promote health and prevent diseases, to healthy food concepts and better cooking practices. These guidelines, developed in a specific socio-cultural context, are expected to strengthen certain desirable traditional habits and modify those practices which are not conducive to good health and nutrition.

The book is the result of dedicated efforts of a Working Group consisting of senior scientists of the National Institute of Nutrition. The draft document was circulated among a panel of experts representing diverse disciplines, and their valuable comments and suggestions were incorporated. I am grateful for their contributions.

The book is addressed to the common man, nutritionists/ dietitians, health professionals and policy planners. It will serve as a sequel for the publication "Nutrient Requirements and Recommended Dietary Allowances for Indians". An abridged version of the book with emphasis on messages is available for wider circulation.

We sincerely believe that this book would find a wide readership contributing to better choice of foods to improve health and nutritional status.

Kamala Krishnaswamy
Director
National Institute of Nutrition
and
Chairperson, Working Group

Hyderabad,
May, 1998.

INTRODUCTION

Nutrition is a basic human need and a prerequisite for healthy life. A proper diet is essential from the very early stages of life for growth, development and active life. Food consumption, which depends on its production and distribution, determines health and nutrition of the population. Apart from supplying nutrients, foods provide a host of other components (non-nutrient phytochemicals) which have a positive impact on health. The recommended dietary allowances (RDA) are nutrient-centred and technical in nature. Since people consume food, it is essential to advocate nutrition in terms of foods, rather than nutrients. Emphasis has, therefore, to be shifted from a nutrient orientation to the food-based approach for attaining optimal nutrition. Such an approach has been advocated by the National Institute of Nutrition (NIN) since its inception. Dietary guidelines are a translation of the scientific knowledge on nutrients into specific dietary advice. They present the recommended dietary allowances of nutrients in terms of diets that should be consumed by the population. The guidelines promote the concept of nutritionally adequate diets and healthy lifestyles from the time of conception to old age.

Formulation of dietary goals and specific guidelines would ensure nutritional adequacy of populations. The dietary guidelines could be directly applied for general population or specific physiological or high-risk groups to derive health benefits. They may also be used by medical and health personnel, nutritionists and dietitians. The guidelines should be consistent with the goals set in national policies on Agriculture, Health and Nutrition.

The dietary guidelines ought to be practical, dynamic and flexible, based on the prevailing dietary situation. Their utility is influenced by the extent to which they reflect the social, economic, agricultural and other environmental factors. The guidelines can be considered as an integral component of the country's comprehensive plan to reach the goals specified in the National Nutrition Policy.

The major food and nutritional issues of concern are insufficient/imbalanced intake of foods/nutrients. The common nutritional problems of public health importance in India are low birth weight, protein energy malnutrition in preschool children, chronic energy deficiency in adults, micronutrient malnutrition and diet-related non-communicable diseases. However, conditions at the either end of the spectrum of malnutrition (under- and over-nutrition) are important. Recent evidence indicates that under-nutrition *in utero* may set the pace for diet-related chronic diseases in later life. Population explosion, demographic changes, rapid urbanization and alterations in traditional habits contribute to the development of certain unhealthy dietary practices leading to diet-related chronic diseases.

The dietary guidelines emphasize promotion of health and prevention of disease, of all age groups with special focus on the vulnerable segments of the population such as infants, children and adolescents, pregnant and lactating women and the elderly. Other related factors, which need consideration for good health are physical activity, health care, safe water supply and socio-economic development, all of which strongly influence nutrition and health.

In this document, food-related approaches, for leading a healthy life, both in qualitative and quantitative terms, have been incorporated. Emphasis is on positive recommendations which can maximize protective effects through use of a variety of foods in tune with traditional habits. The higher goals set with respect to certain food items such as pulses, milk and vegetables/fruits are intended to encourage appropriate agricultural policy decisions to increase their availability. Suitable messages for each of these guidelines have been highlighted.

A variety of foods, which are available and are within the reach of the common man, can be selected to formulate nutritionally adequate diets. While there are only four accepted basic food groups, in India, there are a variety of food preparations and culinary practices. Different cereals/millets are used as staple food, apart from a variety of cereal/millet/pulse combinations in different regions of India. The cooking oils and fats used are of several kinds. The proposed guidelines help to formulate health-promoting recipes and diets which are region- and culture-specific. In this book, instead of “serving”, “portion size” is used. While it is difficult to compute standard portion sizes, common to all regions of India, attempts have been made to give portion sizes and exchanges.

Translation of knowledge into action calls for the co-ordinated efforts of several government and non-government organizations. The fourteen dietary guidelines prescribed herein, stress on adequacy of intake of all food groups for maintenance of optimal health. Effective education campaigns should be launched to encourage people to follow the dietary guidelines. Such efforts should be integrated with the existing national nutrition, health and education programmes. Feedback from the use of these guidelines by individuals, institutions and dietitians will be useful in improving these guidelines further.

CURRENT DIET AND NUTRITION SCENARIO

Health and nutrition are the most important contributory factors for human resource development in the country. India has been classified by the World Bank as a country with a low income economy, with per capita GNP of US \$ 35 (Rs.1400/-). It ranks 135th in terms of human development out of 174 countries. Among the Indian population, about 40% in the rural and 30% in the urban areas are estimated to be below the poverty line, which is defined as the expenditure needed to obtain, on the average, 2400 Kcal per capita per day in the rural areas and 2100 Kcal in urban areas. Long-term malnutrition leads to short adult stature, increased risk of morbidity and mortality and reduced work output.

Common Nutrition Problems

Protein energy malnutrition (PEM), micronutrient deficiencies such as vitamin A deficiency (VAD), iron deficiency anaemia (IDA), iodine deficiency disorders (IDD) and vitamin B-complex deficiencies are the nutrition problems frequently encountered, particularly among the poor.

Under-nutrition starts even at the time of conception. Because of extensive maternal under-nutrition (under-weight, poor weight gain during pregnancy, and nutritional anaemia and vitamin deficiencies), about 30% of the infants are born with low birth-weights (<2500 g), as compared to less than 10% in the developed countries. Both clinical and sub-clinical undernutrition are widely prevalent even during early childhood. About 1-2% of preschool children suffer from severe and florid forms of PEM like kwashiorkor and marasmus. This is only the tip of the iceberg. Countrywide surveys indicate that more than a half of the Indian preschool children (1-5 years) suffer from sub-clinical under-nutrition as indicated by low weight for age [<75% of National Centre for Health Statistics (NCHS) median weight for age] (vide page 30). About 65% of them are stunted (low height for age), which indicates that under-nutrition is of long duration. Persistent under-nutrition throughout the growing phase of childhood leads to short stature in adults. About a half of the adults have a Body Mass Index (BMI) (Weight in kg/Height in metres²) below 18.5, which indicates chronic energy deficiency (CED) (Table 1).

In the case of vitamin A deficiency, upto 3% of preschool children show Bitot's spots and night blindness, and about 30-40 thousand children become blind every year. Vitamin A deficiency also increases the risk of disease and death.

A large segment of the population (approx. 50%) suffers from nutritional anaemia. It is more prevalent in pregnant women (70-90%). More than 50% of preschool children also suffer from anaemia. It is estimated that nutritional anaemia contributes to about 85,000 maternal deaths every year and is one of the important causes of low birth weight. It adversely affects work output among adults and learning ability in children.

Table - 1
Nutritional and Health Status

Aspects	Prevalence			
GROUPS				
Preschool children and Infants (%)				
Low birth weight	30			
Kwashiorkor/Marasmus	1-2			
Bitot spots	3			
Iron deficiency anaemia	50			
Underweight (weight for age)*	53			
Stunting (height for age)*	65			
Adults (%)				
Chronic Energy Deficiency (BMI < 18.5)	50			
Anaemia in Pregnant women	70-90			
General Population				
Anaemia (%)	50			
Goitre (millions)	40			
Cretinism (millions)	2.2			
Still births due to IDD	90,000			
Prevalence of chronic diseases^a				
	Urban	Rural		
	Male	Female	Male	Female
Hypertension (%)	22.0	25.3	11.9	9.4
Obesity BMI (> 27) (%)	36.7	48.6	8.4	11.4
Diabetes Mellitus (%)	13.0	9.9	2.8	2.7
Coronary Heart Disease (%)	8.7	8.8	4.5	6.0
Cancer Incidence ^b (per million)	824	984	415	408

* < Mean - 2 SD

^a : ICMR Multicentric Study - Delhi (Urban); Haryana (Rural) - Unpublished.

^b : National Cancer Registry Programme, ICMR, 1992.

Iodine deficiency disorders (IDD) are very common in large sections of population in several parts of the country. About 200 million are estimated to be living in such regions. Iodine deficiency causes goitre (enlargement of thyroid gland in the neck), neonatal hypothyroidism among new borns, mental retardation, delayed motor development, stunting, deaf-mutism and neuromuscular disorders. The most important consequence of iodine deficiency in mothers is cretinism in which the children suffer from mental and growth retardation since birth. About 90,000 still-births and neonatal deaths occur every year due to

maternal iodine deficiency. Around 40 million persons are estimated to have goitre, 2.2 million have cretinism and 6.6 million suffer from mild psycho-motor handicaps.

Food availability and consumption

The overall production of food grains (cereals/millet/pulses) recorded a significant increase from about 108 million tonnes in 1970-71 to a little over 198 million tonnes during 1996. Though production of cereals and millets appears to be adequate, production of pulses, the most inexpensive source of protein for the rural poor, actually shows a decline. Total production of vegetables is about 30% less than the demand. The total production of milk is about 66 million tonnes, corresponding to about 197 g per caput per day, which is much below the RDA of 250 g. The distribution of foods, both within the community and the family, is unfavourable to some vulnerable groups due to low income and purchasing power, further reducing the availability of these foods. In view of the high cost of milk and flesh foods, a large proportion of the Indian population subsists on diets consisting mostly of plant foods with low nutrient bio-availability (Table 2).

Table - 2
Food availability (Per caput/g/day)

	Y E A R S			RDA	
	1960-61	1970-71	1994-95	Per CU	Per Caput*
Cereals	439	483	532	460	409
Pulses	80	59	42	40	36
Milk	129	106	197	150	134
Vegetables	-	160	214	60	53
Oils	-	15	21	20	18
Meat & Eggs	-	4	13	-	-

* 0.89 CU (Consumption Unit)

Source : Economic Survey, 1995-96
Agricultural Statistics Compendium, 1996

National Nutrition Monitoring Bureau (NNMB) surveys indicate that the daily intake of most foods in Indian households, except for cereals and millets (470 g), is much below the recommended dietary allowances (RDA) (Table 3). The diets provide negligible amounts of protective foods like pulses (29 g) and vegetables. Consumption of green leafy vegetables (<10 g) and other vegetables (70-80 g), which are rich sources of micronutrients like beta-carotene, folate, calcium, riboflavin and iron, is woefully inadequate. Intake of visible fat (vide page 39) is less than 60% of the RDA.

Table - 3

Food Consumption (g/day)

	Intake		RDA
	CU	Per Caput	Per Caput
Cereals/millet	466	415	409
Pulses	33	29.4	36
Milk	97	86.3	134
Vegetables	63	56.1	53
Oils	13	11.6	18

* These values are obtained by multiplying the RDA values per CU by 0.89

Source : National Nutrition Monitoring Bureau, 1996.

The proportion of households with energy inadequacy is about 48%, while that with protein inadequacy is about 20%. Thus, in the cereal/millet-based Indian dietaries, the primary bottleneck is energy and not protein, as was earlier believed. This dietary energy gap can be easily overcome by increasing the quantities of habitually eaten foods by the poor.

On the other side of the spectrum of malnutrition, diet-related non-communicable diseases are commonly seen. With increasing urbanization, energy-rich diets containing higher amounts of fat and sugar, which also provide less dietary fibre and complex carbohydrates, are being consumed, particularly in high-income groups. In addition, the urban population is tending to be more sedentary with little physical activity. Consumption of alcohol, providing empty calories, and of tobacco is also common. Hence, prevalence of disorders like obesity, heart disease, hypertension (high blood pressure) and diabetes, is on the increase.

Determinants of malnutrition

Widespread malnutrition is largely a result of dietary inadequacy. Other contributing factors are poor purchasing power, faulty feeding habits, large families, frequent infections, poor health care and low agricultural production. Population living in the backward and drought-prone rural areas and urban slums, and those belonging to the socially backward groups like scheduled castes and tribal communities are highly susceptible to under-nutrition. Similarly, landless labourers and destitutes are at higher risk.

The most rational, sustainable and long-term solution to the problem of malnutrition is ensuring availability, access and consumption of adequate amounts of foods. Dietary guidelines help to achieve the objective of providing optimal nutrition to the population.

DIETARY GOALS

1. Maintain a state of positive health and optimal performance in populations at large.
2. Ensure adequate nutritional status for pregnant women and lactating mothers.
3. Improve birth weights and promote growth of infants, children and adolescents to achieve their full genetic potential.
4. Achieve adequacy in all nutrients and prevent deficiency diseases.
5. Prevent chronic diet-related disorders.
6. Maintain the health of the elderly and increase the life expectancy.

DIETARY GUIDELINES

1. A nutritionally adequate diet should be consumed through a wise choice from a variety of foods.
2. Additional food and extra care are required during pregnancy and lactation.
3. Exclusive breast-feeding should be practised for 4-6 months. Breast-feeding can be continued upto two years.
4. Food supplements should be introduced to infants by 4-6 months.
5. Adequate and appropriate diet should be taken by children and adolescents, both in health and disease.
6. Green leafy vegetables, other vegetables and fruits should be used in plenty.
7. Cooking oils and animal foods should be used in moderation, and *vanaspati*/ghee/butter should be used only sparingly.
8. Over-eating should be avoided to prevent over-weight and obesity. Proper physical activity is essential to maintain desirable body weight.
9. Salt should be used in moderation.
10. Foods consumed should be safe and clean.
11. Healthy and positive food concepts and cooking practices should be adopted.
12. Water should be taken in adequate amounts and beverages should be consumed in moderation.
13. Processed and ready-to-eat foods should be used judiciously. Sugar should be used sparingly.
14. The elderly should eat a nutrient-rich diet to keep fit and active.

1

A NUTRITIONALLY ADEQUATE DIET SHOULD BE CONSUMED THROUGH A WISE CHOICE FROM A VARIETY OF FOODS

- Nutrition is a basic prerequisite to sustain life.
- Variety in food is not only the spice of life but also the essence of nutrition and health.
- A diet consisting of several food groups provides all the required nutrients in proper amounts.
- Cereals, millets and pulses are major sources of most nutrients.
- Milk which provides good quality proteins and calcium must be an essential item of the diet, particularly for infants, children and women.
- Oils and nuts are calorie-rich foods, and are useful for increasing the energy density.
- Inclusion of eggs, flesh foods and fish enhances the quality of diet. However, vegetarians can derive almost all the nutrients on cereal/pulse/milk-based diets.
- Vegetables and fruits provide protective substances such as vitamins/minerals.

Why do we need nutritionally adequate food ?

Nutrients that we obtain through food have vital effects on physical growth and development, maintenance of normal body function, physical activity and health. Nutritious food is, thus needed to sustain life and activity. Our diet must provide all essential nutrients in the required amounts. Requirements of essential nutrients vary with age, gender, physiological status, physical activity and stress. Dietary intakes lower or higher than the body requirements can lead to under-nutrition (deficiency diseases) or over-nutrition (diseases of affluence) respectively. Eating too little food during the vulnerable periods of life such as infancy, childhood, adolescence, pregnancy and lactation and eating too much at any age can lead to harmful consequences. An adequate diet, providing all nutrients, is needed throughout our lives. The nutrients must be obtained through a judicious choice and combination of a variety of foods (Figure 1).

Carbohydrates, fats and proteins are macronutrients, which are needed in large amounts. Vitamins and minerals constitute the micronutrients and are required in small amounts. These nutrients are necessary for physiological and biochemical processes by which the human body acquires, assimilates and utilizes food to maintain health and activity.

Carbohydrates

Carbohydrates are either simple or complex, and are major sources of energy in all human diets. They provide energy of 4 Kcal/g. The simple carbohydrates, glucose and fructose, are found in fruits, vegetables and honey, sucrose in sugar and lactose in milk while the complex polysaccharides are starches in cereals, millets, pulses and root vegetables and glycogen in animal foods. The other complex carbohydrates which are resistant to digestion in the human digestive tract are cellulose in vegetables and whole grains, and gums and pectins in vegetables, fruits and cereals, which constitute the dietary fibre component. In India, 70-80% of total dietary calories are derived from carbohydrates present in plant foods such as cereals, millets and pulses.

Dietary fibres delay and retard absorption of carbohydrates and fats and increase satiety value. Diets rich in fibre reduce glucose and lipids in blood and increase the bulk of the stools. Diets rich in complex carbohydrates are healthier than low-fibre diets based on refined and processed foods.

Proteins

Proteins are primary structural and functional components of every living cell. Almost half the protein in our body is in the form of muscles and the rest of it is in bone, cartilage and skin. Proteins are complex molecules composed of different amino acids. Certain amino acids which are termed "essential" since they are not synthesized in the human body and have to be obtained from proteins in the diet. Other non-essential amino acids can be synthesized in the body to build proteins. Proteins perform a wide range of functions and also provide energy (4 Kcal/g).

Protein requirements vary with age, physiological status and stress. More proteins are required by growing infants and children, pregnant women and individuals during infections and illness or stress. Animal foods like milk, meat, fish and eggs and plant foods such as legumes are rich sources of proteins. Animal proteins are of high quality as they provide all the essential amino acids in right proportions, while plant or vegetable proteins are not of the same quality because of their low content of some of the essential amino acids. However, a combination of cereals, millets and pulses provides most of the amino acids, which complement each other to provide better quality proteins.

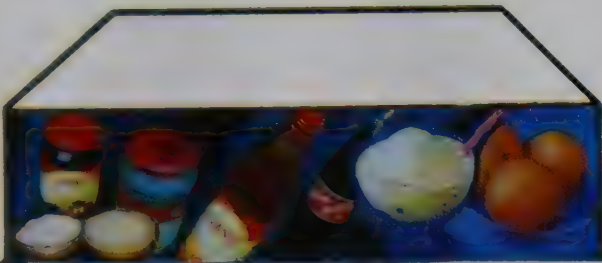
Fats

Oils and fats such as butter and ghee constitute dietary fats. Fats are a concentrated source of energy providing 9 Kcal/g, and are made up of fatty acids in different proportions. Dietary fats are derived from two sources viz. the invisible fat present in plant and animal foods; and the visible or added fats and oils (cooking oil) (vide page 38). Fats serve as a vehicle for fat-soluble vitamins like vitamins A and E and carotenes and promote their absorption. They are also sources of essential polyunsaturated fatty acids. It is necessary to have adequate and good quality fat in the diet with sufficient polyunsaturated fatty acids in

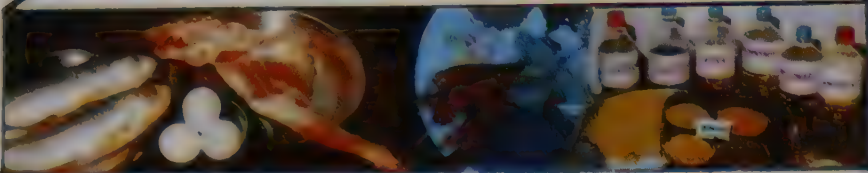
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proper proportions for meeting the requirements of essential fatty acids (vide page 38). The type and quantity of fat in the daily diet influence the level of cholesterol and triglycerides in the blood. Diets should include adequate amounts of fat particularly in the case of infants and children, to provide concentrated energy since their energy needs per kg body weight are nearly twice those of adults per kg body weight. Adults need to be cautioned to restrict intake of saturated fat (butter, ghee and hydrogenated fats) and cholesterol (eggs, organ meat). Excess of these substances could lead to obesity, diabetes, cardiovascular disease and cancer.

Vitamins and minerals

Vitamins are chemical compounds required by the body in small amounts. They must be present in the diet as they cannot be synthesized in the body. Vitamins are essential for numerous body processes and for maintenance of the structure of skin, bone, nerves, eye, brain, blood and mucous membrane. They are either water-soluble or fat-soluble. Vitamins A, D, E and K are fat-soluble, while vitamin C, and the B-complex vitamins such as thiamin (B_1), riboflavin (B_2), niacin, pyridoxine (B_6), folic acid and cyanocobalamin (B_{12}) are water-soluble. Pro-vitamins like beta-carotene are converted to vitamins in the body into vitamin A. Fat-soluble vitamins can be stored in the body while water-soluble vitamins are not and get easily excreted in urine. Vitamins B-complex and C are labile vitamins and are easily destroyed by heat, air or during drying, cooking and food processing.

Minerals are inorganic elements found in body fluids and tissues. The important macro minerals are sodium, potassium, calcium, phosphorus, magnesium and sulphur, while zinc, copper, selenium, molybdenum, fluorine, cobalt, chromium and iodine are microminerals. They are required for maintenance and integrity of skin, hair, nails, blood and soft tissues. They also govern nerve cell transmission, acid/base and fluid balance, enzyme and hormone activity as well as the blood- clotting processes.

What is a balanced diet ?

A balanced diet is one which provides all the nutrients in required amounts and proper proportions. It can easily be achieved through a blend of four basic food groups. The quantities of foods needed to meet the nutrient requirements vary with age, gender, physical activity and physiological status. A balanced diet should provide around 60-70% of total calories from carbohydrates, preferably starch, about 10-12% from proteins and 20-25% from fat.



In addition, a balanced diet should provide other non-nutrients such as dietary fibre, antioxidants and phytochemicals which bestow positive health benefits. Antioxidants such as vitamins C and E, beta-carotene, riboflavin and selenium protect the human body from free radical damage. Other phytochemicals such as polyphenols, flavones, etc., also afford protection against oxidant damage. Spices like turmeric, ginger, garlic, cumin and cloves are rich in antioxidants.

Table - 4

	MAJOR NUTRIENTS	OTHER NUTRIENTS
ENERGY RICH FOODS	Carbohydrates & fats	
	Whole grain cereals, millets	Protein, fibre, minerals, calcium, iron & B-complex vitamins
	Vegetable oils, ghee, butter	Fat soluble vitamins, essential fatty acids
	Nuts and oilseeds	Proteins, vitamins/minerals
	Sugars	Nil
BODY BUILDING FOODS	Proteins	
	Pulses, nuts and oilseeds	B-complex vitamins, invisible fat, fibre
	Milk and Milk products	Calcium, vitamin A, riboflavin, vitamin B ₁₂
	Meat, fish, poultry	B-complex vitamins, iron, iodine, fat
PROTECTIVE FOODS	Vitamins and Minerals	
	Green leafy vegetables	Antioxidants, fibre and other carotenoids
	Other vegetables/fruits	Fibre, sugar and antioxidants
	Eggs, milk and milk products and flesh foods	Protein and fat

What are food groups ?

Foods are conventionally grouped as :

1. Cereals, millets and pulses
2. Vegetables and fruits
3. Milk and milk products, egg, meat and fish
4. Oils and fats and nuts and oilseeds

However, foods may also be classified according to their functions (Table 4).

What are nutrient requirements and recommended dietary allowances (RDA)?

Requirements are the quantities of nutrients that healthy individuals must obtain from food to meet their physiological needs. The recommended dietary allowances (RDAs) are estimates of nutrients to be consumed daily to ensure the requirements of all individuals in a given population. The recommended level depends upon the bioavailability of nutrients from a given diet. The term bioavailability indicates what is absorbed and utilized by the body. In addition, RDA include a margin of safety, to cover variation between individuals, dietary traditions and practices. The recommended dietary allowances are suggested for physiological groups such as infants, pre-schoolers, adolescents, pregnant women and lactating mothers, and adult males and females, taking into account their physical activity. In fact, RDA are suggested averages/day. However, in practice, fluctuations in intake may occur depending on the food availability and demands of the body. But, the average requirements need to be satisfied over a period of time (Annexure-1).

The diet that one consumes must provide adequate calories, proteins and micronutrients to achieve maximum growth potential. There may be situations where adequate amounts of nutrients may not be available through diet alone. In such high risk situations where specific nutrients are lacking, fortified food, such as iodized salt, is necessary.

- Choose a variety of foods in amounts appropriate for age, gender, physiological status and physical activity.
- Use a combination of grains, grams and greens. Include jaggery or sugar and cooking oils to bridge the calorie or energy gap.
- Prefer fresh vegetables and fruits in plenty.
- Include in the diets, foods of animal origin such as milk, eggs and meat, particularly for pregnant and lactating women and children.
- Adults should choose low-fat, protein-rich foods such as lean meat, fish, pulses and low-fat milk.
- Develop healthy eating habits and exercise regularly.

IMPORTANCE OF DIET DURING DIFFERENT STAGES OF LIFE

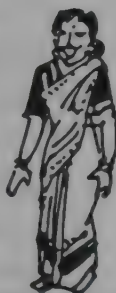
For being physically active and healthy.

Nutrient dense low fat foods.



For maintaining health productivity and prevention of diet-related disease and to support pregnancy/lactation.

Nutritionally adequate diet with extra food for child bearing/rearing.



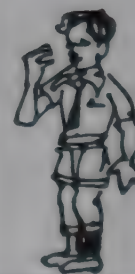
For growth spurt, maturation and bone development.

Body building and protective foods.



For growth, development and to fight infections.

Energy, body building and protective food (milk, vegetables and fruits).

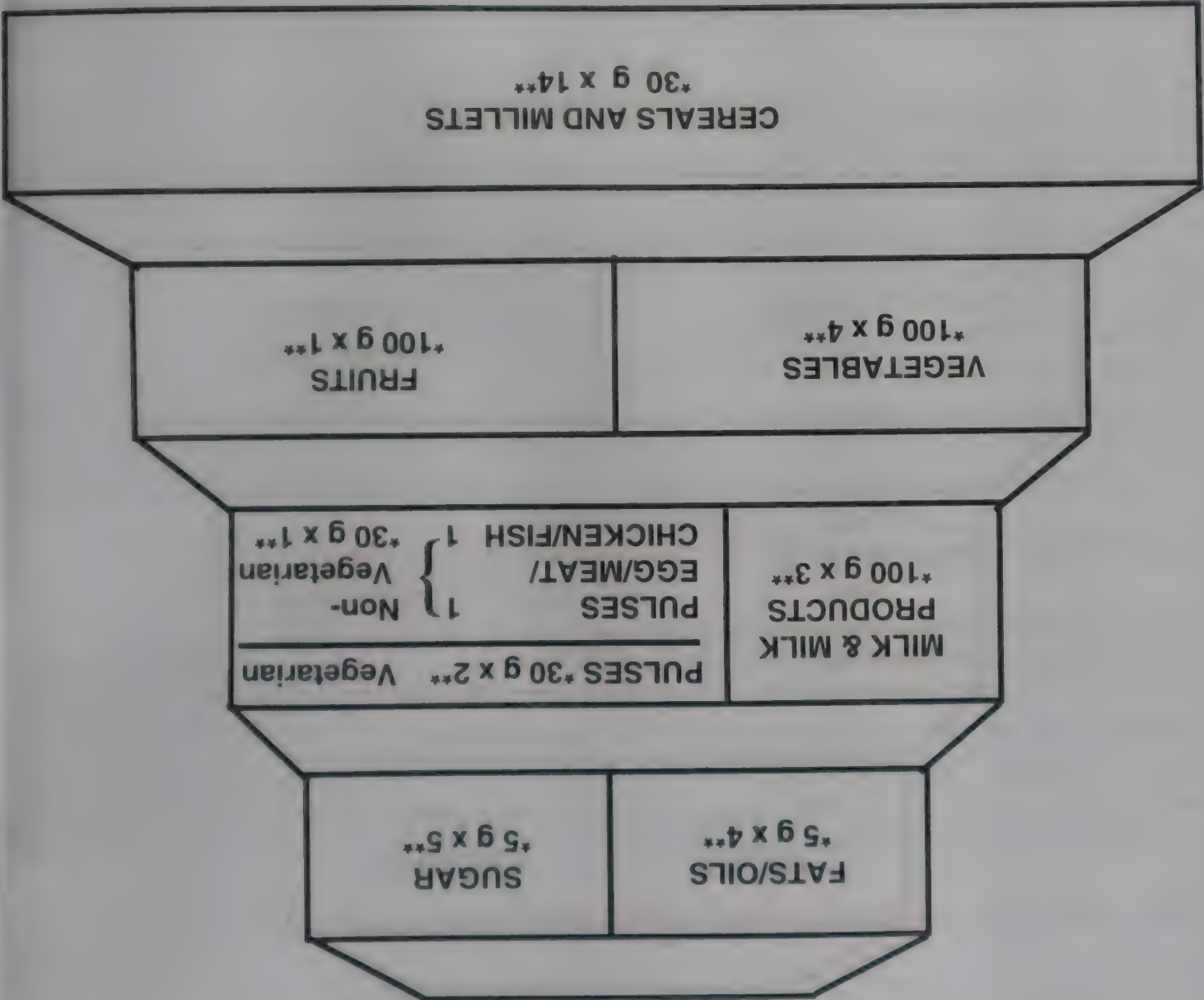


For growth and appropriate milestones.

Breastmilk, energy rich foods (fats, sugar).



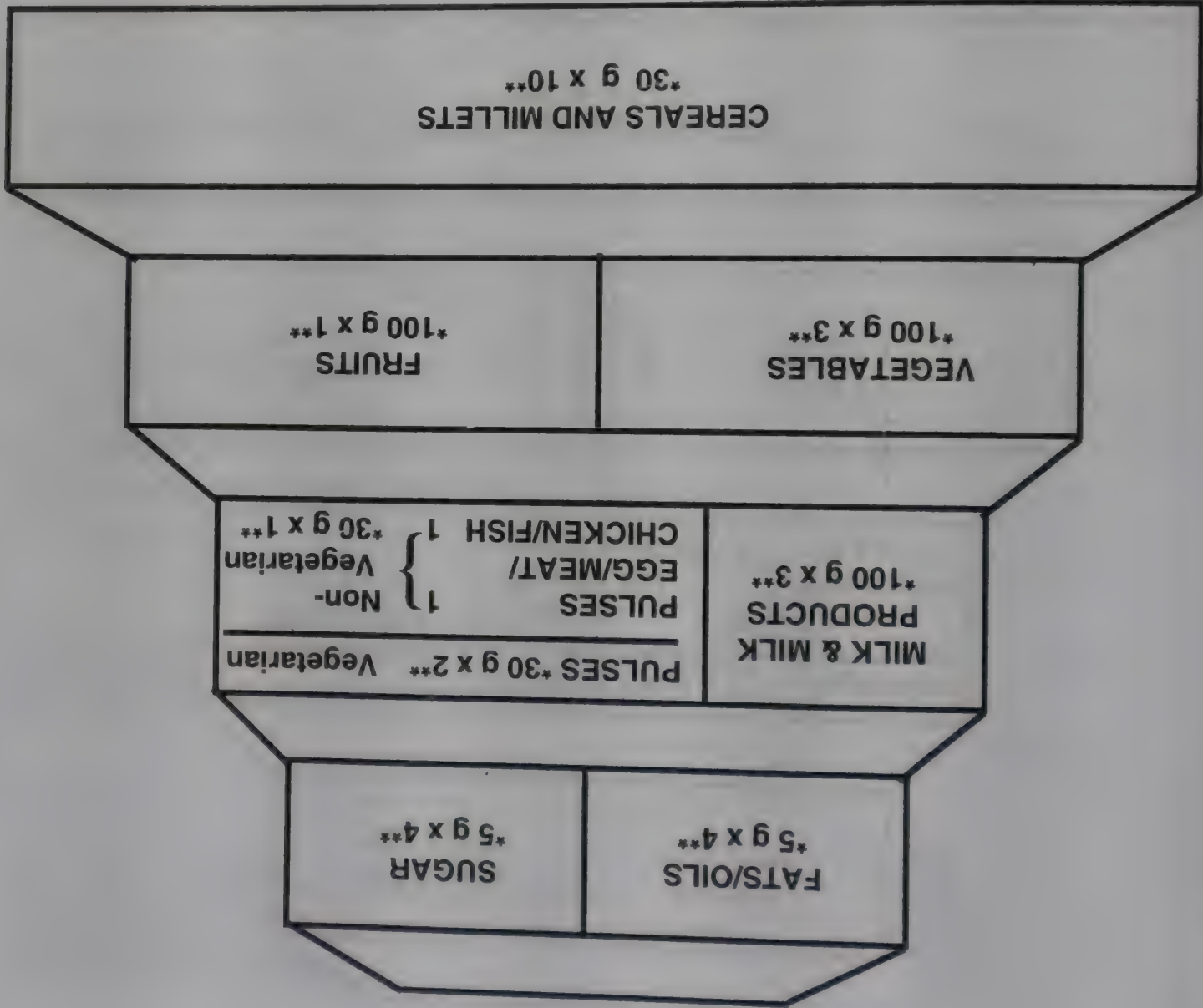
BALANCED DIET FOR ADULT MAN (SEDENTARY)



* Portion Size. ** No. of Portions

Elderly man : Reduce 3 portions of cereals and millets and add an extra serving of fruit.

BALANCED DIET FOR ADULT WOMAN (SEDENTARY)



* Portion Size. ** No. of Portions

Extra Portions :

Pregnant women :

Lactating women :

Fat/Oil-2, Milk-2, Fruit-1, Green Leafy Vegetables-1/2.
Cereals-1, Pulse-1, Fat/Oil-2, Milk-2, Fruit-1, Green Leafy
Vegetables - 1/2.

Between 6-12 months of lactation, diet intake should be gradually brought back to normal.
Elderly women : Fruit-1, reduce cereals and millets-2.

② ADDITIONAL FOOD AND EXTRA CARE ARE REQUIRED DURING PREGNANCY AND LACTATION

- Pregnancy is physiologically and nutritionally a highly demanding period. Extra food is required to satisfy the needs of the foetus.
- A woman prepares herself to meet the nutritional demands by increasing her own body fat deposits during pregnancy.
- A lactating mother requires extra food to secrete adequate quantities of milk and to safeguard her own health.

Why additional diet is required during pregnancy and lactation ?

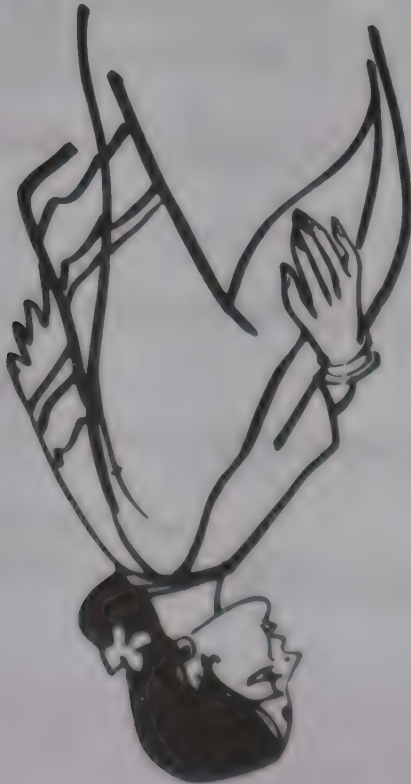
Pregnancy is a demanding physiological state. In India, it is observed that diets among women from the poorer groups are essentially similar during pre-pregnant, pregnant and lactating periods. Consequently, there is widespread maternal malnutrition leading to high prevalence of low birth weight infants and very high maternal mortality. Additional foods are required to improve the birth weights and to increase the mother's body fat deposits. Similarly, a lactating woman needs extra nutrients to secrete adequate quantities of breast-milk of normal nutrient composition and to maintain her own health.

What are the nutrients that require special attention ?

The daily diet of a woman should contain an additional 300 calories, 15 g of protein and 10 g of fat from mid-pregnancy. The requirements further increase to about 500 calories, 25 g each of protein and fat per day, during lactation. Some micronutrients are specially required in extra amounts during these physiological periods. Folic acid, taken throughout the pregnancy, reduces the risk of congenital malformations and increases the birth weight. The mother as well as the growing foetus need iron to meet the high demands of erythropoiesis (RBC formation). Calcium is essential, both during pregnancy and lactation, for proper formation of bones and teeth of the offspring and for secretion of breast-milk rich in calcium to prevent osteoporosis in the mother. Similarly, iodine intake ensures proper mental health of the growing foetus and infant. Vitamin A is required during lactation to improve child survival. Besides these, nutrients like vitamins B₁₂ and C need to be taken by the lactating mother.

How can the pregnant and lactating women meet these nutritional demands?

The pregnant/lactating woman should eat a wide variety of foods to make sure that her own nutritional needs as well as those of her growing foetus/infant are met. There is no particular need to modify the usual dietary pattern. However, the quantity and frequency of usage of the different foods should be increased. She can derive maximum amount of energy



(about 60%) from rice, wheat and millets. Cooking oil is a concentrated source of both energy and polyunsaturated fatty acids. Good quality protein is derived from milk, fish, meat, poultry and eggs. However, a proper combination of cereals, pulses and nuts also provides adequate proteins. Mineral and vitamin requirements are met by consuming a variety of seasonal vegetables particularly green leafy vegetables, milk and fresh fruits. Bioavailability of iron can be improved by using fermented and sprouted grams and foods rich in vitamin C such as citrus fruits. Milk is the best source of biologically available calcium. Though it is possible to meet the requirements for most of the nutrients through a balanced diet, pregnant/lactating women are advised to take daily supplements of iron, folic acid, vitamin B₁₂ and calcium.

What additional care is required ?

Adequate intake of a nutritious diet is reflected in optimal weight gain during pregnancy (10-12 kg) by the expectant woman. She should choose foods rich in fibre like whole grain cereals, pulses and vegetables, to avoid constipation. She should take plenty of fluids including 8-12 glasses of water per day. Salt intake should not be restricted even to prevent pregnancy-induced hypertension and pre-eclampsia. Excess intake of beverages containing caffeine like coffee and tea adversely affect foetal growth and, hence, should be avoided.

In addition to satisfying these dietary requisites, a pregnant woman should undergo periodic health check-up for weight gain, blood pressure, anaemia and receive tetanus toxoid immunization. She requires adequate physical exercise with adequate rest for 2-3 hrs during the day. Pregnant and lactating women should not indiscriminately take any drugs without medical advice, as some of them could be harmful to the foetus/baby. Smoking and tobacco chewing and consumption of alcohol should be avoided. Wrong food beliefs and taboos should be discouraged (vide page 51).

- ◆ Iron is needed for haemoglobin synthesis, mental function and body defence.
- ◆ Deficiency of iron leads to anaemia.
- ◆ Iron deficiency is common particularly in women of reproductive age and in children.
- ◆ Iron deficiency during pregnancy increases maternal mortality and low birth weight in infants.
- ◆ In children, it increases susceptibility to infection and impairs learning ability.
- ◆ Plant foods like legumes, dried fruits and green leafy vegetables contain iron.
- ◆ Iron is also obtained through meat, fish and poultry products.
- ◆ Iron bio-availability is poor from plant foods but is good from animal foods.
- ◆ Fruits rich in vitamin C like amla, guava and citrus fruits improve iron absorption from plant foods.
- ◆ Beverages like tea bind dietary iron and make it unavailable. Hence they should be avoided before, during or soon after a meal.

EAT IRON-RICH FOODS

- ◆ Folic acid is essential for the synthesis of haemoglobin.
- ◆ Folic acid deficiency leads to macrocytic anaemia.
- ◆ Pregnant women need more of folic acid.
- ◆ Folic acid supplements increase birth weight and reduce congenital anomalies.
- ◆ Green leafy vegetables, legumes, nuts and liver are good sources of folic acid.

EAT FOLATE-RICH FOODS

- Eat more food during pregnancy and lactation.
- Eat more whole grains, sprouted grains and fermented foods.
- Take milk/meat/eggs.
- Eat plenty of vegetables and fruits.
- Avoid superstitions and food taboos.
- Do not use alcohol and tobacco. Take medicines only when prescribed.
- Take iron, folate and calcium supplements regularly, after 14-16 weeks of pregnancy and continue the same during lactation.

Breast-milk provides good quality proteins, fat, vitamins, calcium, iron and other minerals even beyond four months. In fact, its quality can be improved by supplementing the diet of

In addition to providing nutrients, breast-milk has several special components such as growth factors, enzymes, hormones and anti-infective factors. The amount of milk secreted increases gradually in the first few days after delivery, reaching the peak during the second month, at which level it is maintained until about 4-6 months of age. An average Indian woman secretes about 750 ml of milk per day during the first 6 months and 600 ml/day subsequently upto one year. Many essential components are in concentrated amounts in colostrum as compared to mature milk, compensating for the low output during early lactation.

What are the advantages of breast-milk ?

Breast-milk contains all essential nutrients needed for the infant; it provides the best nutrition and protects the infant from infections. Breast-milk is a natural food and is more easily digested and absorbed by the infant as compared to formula milk prepared from other sources. Colostrum, which is the milk secreted during the first 3 days after child birth, is rich in proteins, minerals, vitamins especially vitamin A and antibodies. In addition, it has a laxative effect as well. Breast-feeding helps in reducing fertility and facilitates spacing of children. Lactation provides emotional satisfaction to the mother and the infant. Therefore, breast milk is the best milk for the newborn and growing infant.

Why breast-feed the infant ?

- Breast-milk is the most natural and perfect food for normal growth and healthy development of infants.
- Colostrum is rich in nutrients and anti-infective factors and should be fed to infants.
- Breast-feeding reduces risk of infections.
- It establishes mother-infant contact and promotes mother-child bonding.
- It prolongs birth interval by fertility control (delayed return of menstruation).
- Breast-feeding helps in retraction of the uterus.
- Incidence of breast cancer is lower in mothers who breast feed their children.

EXCLUSIVE BREAST-FEEDING SHOULD BE PRACTISED AT LEAST FOR 4-6 MONTHS. BREAST-FEEDING CAN BE CONTINUED UPTO TWO YEARS

the mother with nutrients. Growth performance of breast-fed infants is satisfactory upto 4-6 months of age.

When to start breast feeding and how long to continue ?

Mother-infant contact should be established as early as possible (immediately after birth) by permitting the infant to suck at the breast. Mothers can breast-feed from as early as 30 minutes after delivery. Colostrum should be made available to the infant immediately after birth. Feeding honey, glucose, water or dilute milk formula before lactation should be avoided and the infant should be allowed to suck, which helps in establishing lactation. Colostrum should not be discarded, as is sometimes practised.

Breast-feeding in India is common among the rural and urban poor, being less so among the urban middle and upper classes. The poorer groups continue breast-feeding for longer duration than the educated upper and middle income groups. The economically advantaged or the working mother, tends to discontinue breast-feeding early. A baby should be exclusively breast-fed only upto 4-6 months and supplementary foods should be introduced thereafter. Breast-feeding helps in maintaining lactation for a long time. If babies are quiet or sleep for 2 hours after a feed and show adequate weight gain, feeding may be assumed as adequate. Breast-fed infants do not need additional water. Feeding unsafe water increases the risk of diarrhoea and should, therefore, be avoided.

What are the effects of maternal malnutrition on breast-milk ?

Composition of breast-milk depends to some extent on maternal nutrition. In general, even the undernourished mothers can successfully breast-feed. But in the case of severe malnutrition, both the quality and quantity of breast-milk may be affected. Protein content of breast-milk appears to be much less affected as compared to fat in malnutrition. Concentration of water-soluble vitamins, vitamin A (and beta-carotene) are influenced by the quality of the maternal diet. Administration of supplements of vitamins A and B-complex to lactating mothers increases the levels of these vitamins in breast-milk. Calcium and iron content can be increased in breast-milk by providing respective supplements to the mother. Also, iron

from breast-milk is better absorbed. Trace element composition of breast-milk, however, is not affected by the mother's nutritional status.

How does breast-milk protect against infection ?

Diseases and death among breast-fed infants are much lower than those among formula-fed infants. Breast-feeding protects against diarrhoea and upper respiratory tract infections. The bifidus factor in breast-milk promotes the natural gut flora. The gut flora and the low pH of breast-milk inhibit the growth of pathogens. Breast-milk has immunoglobulins (IgA), lactoferrin, lactoperoxidase and complement which protect the infant from several infections. Antibodies to *E-coli* and some viruses are found in breast milk, which protect the gut mucosa. Breast-feeding also protects infants from vulnerability to allergic reactions.

What ensures an adequate supply of breast-milk ?

It is necessary that the woman is emotionally prepared during pregnancy for breast-feeding and is encouraged to eat a well-balanced diet. Anxiety and emotional upset must be avoided and adequate rest should be ensured. It is necessary to prepare the breast, particularly the nipple, for breast-feeding. Mother should accept the baby for breast-feeding as early as possible after delivery and feed the child on demand.

Are drugs secreted in breast-milk ?

Since drugs (antibiotics, caffeine, hormones and alcohol) are secreted into the breast-milk and could prove harmful to the breast-fed infant, caution should be exercised by the lactating mother.

- Start breast-feeding within an hour after delivery and do not discard colostrum.
- Breast-feed exclusively for a minimum of four to six months.
- Continue breast-feeding even after introduction of supplements (weaning foods), upto 2 years.
- Breast-feed the infant frequently or on demand to establish and maintain good milk supply.
- Take a nutritionally adequate diet both during pregnancy and lactation.
- Avoid tobacco (smoking and chewing), alcohol and drugs during lactation.
- Ensure active family support for breast-feeding.

4 FOOD SUPPLEMENTS SHOULD BE INTRODUCED FOR INFANTS BY 4-6 MONTHS

- Breast-milk alone is not adequate for the infant beyond 4-6 months of age.
- Introduction of food supplements along with breast-feeding is necessary to infants by 4-6 months of age.
- Provision of adequate and appropriate supplements to young children prevents malnutrition.
- Hygienic practices should be observed while preparing and feeding the weaning food to the child; otherwise, it will lead to diarrhoea.

It is well accepted that breast milk is the best food for an infant. Fortunately, in India, most rural mothers are able to breast-feed their children for prolonged periods. In fact, this is a boon to Indian children as otherwise the prevalence of under-nutrition among them would have been much higher. However, often, children are solely breast-fed even beyond the age of one year in the belief that breast-milk alone is adequate for the child until he/she is able to pick up food and eat. This practice results in under-nutrition among young children. Working mothers, on the other hand, are unable to breast-feed their children for longer periods, as they go to work outside.

What are supplements ?

Foods that are regularly fed to the infant, in addition to breast-milk, providing sufficient nutrients are known as supplementary or complementary foods. These could be liquids like milk or semi-solids like '*kheer*' in the case of infants, or solid preparations like rice etc., in the case of children over the age of one year.

Why use supplements and when ?

At birth, mother's milk alone is adequate for the infant. Requirements of all the nutrients progressively increase with the infant's growth. Simultaneously, the breast-milk secretion in the mother comes down with time. Thus, infants are deprived of adequate nutrients due to the dual factors of increased nutrient requirements and decreased availability of breast-milk. Usually, these changes occur at about 4-6 months of age. Hence, promotion of optimal growth in infants, calls for introduction of adequate food supplements in addition to continued breast feeding, from the age of 4-6 months onwards.

Can home-made recipes be nutritious supplements ?

Low cost food supplements can be prepared at home from commonly used ingredients such as cereals (wheat, rice, ragi, jowar, bajra, etc.); pulses (grams/dhals), nuts and oilseeds (groundnut, sesame, etc.), oils (groundnut oil, sesame oil etc.) and sugar and jaggery. Such supplements are easily digested by all infants, including those with severe malnutrition. The impression that only the commercially available supplementary foods are nutritious, is not correct. Some examples of low cost weaning foods are given on pages 27-28.

What are the principles in preparing weaning food supplements ?

Weaning foods based on cereal-pulse-nut and sugar/jaggery combinations will provide good quality protein, adequate calories and other protective nutrients. Since infants cannot consume bulky weaning food, in sufficient quantities, energy-rich foods like fats and sugars should be included in such preparations. Infants can also be fed green leafy vegetables (GLV), which are rich, yet inexpensive, sources of vitamins and minerals. However, greens should be well cleaned before cooking lest the infants develop loose motions. Dietary fibre in green leafy vegetables can, by itself, promote the bowel movements leading to loose motions in infants. Since GLV are rich in dietary fibre, it is advisable to initially feed only the juice of the GLV after cooking them properly. Infants should be introduced to different vegetables and fruits gradually. It should, however, be remembered that these dietary articles should be thoroughly cooked and mashed before feeding. In families which can afford them, egg yolk and meat soup can be introduced. At about one year of age, the child should share the family diet.

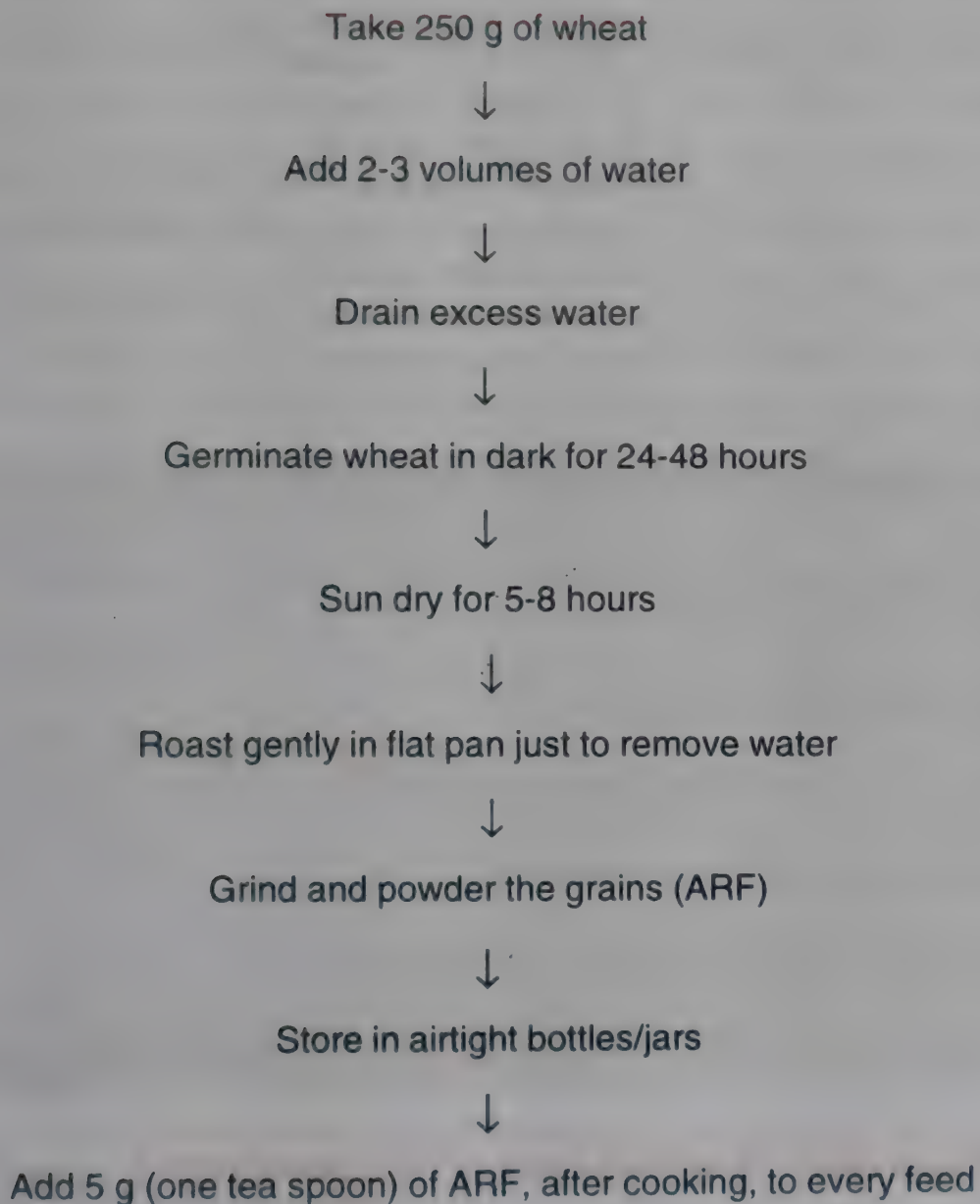
Amylase-rich foods

Flours of germinated cereals, which are rich in the enzyme alpha-amylase, constitute Amylase-Rich Foods (ARF). Even small amounts of this type of foods liquefy and reduce the bulk of the cereal-based diet. Thus, ARF helps in increasing the energy density of weaning gruels and in reducing its bulk as well.

Mothers can add ARF to increase the digestibility of the low-cost weaning foods prepared at home. Preparation of ARF is very simple and can be done by mothers at home.



PREPARATION OF AMYLASE RICH FOOD (ARF)



How to feed a young infant ?

Infants cannot eat large quantities of food in one sitting at a given time. So, they should be fed small quantities at frequent intervals (5-6 times a day). Also, the food should be of semi-solid consistency for easy swallowing. When such semi-solid foods are offered initially, the infant tends to spit it out. This should not be mistaken as dislike for that food. The fact is that the young infant cannot achieve full coordination needed for the act of swallowing, and, hence, brings out the food by movements of its tongue. Physiological maturity of swallowing the semi-solid food develops when the food is regularly given every day.

What are the hygienic practices to be adopted ?

It is important to ensure that hygienic practices are scrupulously followed. All the dietary ingredients should be thoroughly cleaned. Vegetables should be washed well to remove contaminants/parasites/pesticides before cutting. Vegetables should preferably be steam-cooked to reduce cooking losses. At the time of preparation and feeding of the recipes, mother should observe proper personal hygiene and the utensils used for cooking should be thoroughly washed or sterilized, wherever possible. A number of pre-cooked and ready-to-eat foods can be prepared for use as weaning foods (vide pages 27-28). Such foods should be stored in clean bottles or tins. As feeding is likely to be time consuming, the cup or the plate from which the recipe is being fed to the infant should be kept covered to protect it from flies. Most often, diarrhoea is caused by unhygienic practices adopted by mothers. The weaning foods which are properly cleaned and well-cooked are safe even for young infants.

- **Breast-milk alone is not enough for infants after 4-6 months of age.**
- **Feed supplements to the infants starting from 4-6 months of age, but continue breast-feeding.**
- **Do not delay supplementation.**
- **Feed low-cost home-made weaning foods.**
- **Feed supplements 5-6 times a day.**
- **Provide fruits and well cooked vegetables.**
- **Observe hygienic practices while preparing and feeding the supplement.**

What should be done if breast-milk is not adequate ?

- ◆ *If breast-feeding fails, the infant needs to be fed animal milk or commercial infant formula.*
- ◆ *Milk should be boiled before being fed to the baby.*
- ◆ *To start with, milk may be diluted with an equal volume of water.*
- ◆ *Full strength milk may be started from 4 weeks of age.*
- ◆ *Infants fed animal milk should receive supplements of iron and vitamin C.*
- ◆ *About 120-180 ml of milk should be fed with one teaspoon of sugar per feed, 6-8 times over the day.*
- ◆ *While reconstituting the infant formula, the instructions given on the label should be strictly followed.*
- ◆ *The feeds should be prepared and given using a sterile cup, spoon, bottles and nipples, taking utmost care.*
- ◆ *Overfeeding should be avoided in artificially-fed infants to prevent obesity.*
- ◆ *Low-cost home-made weaning foods are preferred. However, commercially available preparations may be used by those who can afford them.*

WEANING FOODS

1. Kichidi :

Rice	...	30 g
Green gram dhal	...	15 g
Leafy vegetables	...	2 tbsp
Fat	...	2 tbsp
Cumin (jeera)		

Method : Clean rice and dhal and cook them in water with salt till the grains are soft and water is absorbed. Leafy vegetables can be added when the cereal/pulse is 3/4th done. Cumin is fried in fat and added towards the end.

2. Malted Ragi Porridge

Malted Ragi	...	30 g
Roasted Groundnut	...	15 g
Jaggery	...	20 g

Method : Malted ragi, roasted groundnuts and jaggery are powdered. Sufficient water is added and cooked.

3. Wheat Payasam :

Wheat	...	30 g
Roasted Bengal gram flour	...	15 g
Roasted & crushed Groundnut	...	5 g
Sugar	...	15 g

Method : Roast whole wheat and powder. Add roasted Bengal gram flour, groundnut and sugar. Cook with sufficient water.

4. Kheer

Vermicelli/Rice	...	30 g
Milk	...	100 ml.
Water	...	As required
Jaggery	...	20 g

Method: Boil rice/vermicelli in water till half done. Add milk and bring to boil. Add jaggery and cook well.

- Note :
1. All these recipes provide approximately 250 Kcals. and 5 g proteins and amounts given are for 2 servings.
 2. Recipes Nos.2 and 3 can be prepared and stored in airtight containers to be used whenever required.
 3. Non-vegetarian foods such as soft boiled egg, minced meat may be introduced at the age of 6 months.

ADEQUATE AND APPROPRIATE DIET SHOULD BE TAKEN BY CHILDREN AND ADOLESCENTS BOTH IN HEALTH AND DISEASE

- A nutritionally adequate diet is essential for optimal growth and development.
- Appropriate diet during childhood may reduce the risk of diet-related chronic diseases in later life.
- Common infections and malnutrition contribute significantly to child morbidity and mortality.
- A child needs to eat more during and after episodes of infections to maintain good nutritional status.

Why do children and adolescents require more food ?

Childhood and adolescence are periods of continuous growth and development. An infant grows rapidly, doubling its birth weight by 5 months and trebling it by 1 year of age. During the second year, the child increases not only in height by 7-8 cms but also gains 4 times of its birth weight. During the pre-adolescent period the child grows, on an average, 6-7 cms in height and 1.5 to 3 kgs in weight every year and simultaneously development and maturation of various tissues and organs take place (Table 5).

Adolescent period (teenage) is spread almost over a decade. It is characterized by rapid increase in height and weight, hormonal changes, sexual maturation and wide swings in emotion. Adolescent growth spurt starts at about 10-12 years in girls and two years later in boys. The annual peak rates for height and weight are 9-10 cms and 8-10 kgs. Development of critical bone mass is essential during this period as this forms the ground for maintaining mineral integrity of the bone in later life. The pattern and proportion of various body components like body water, muscle mass, bone and fat increase during the entire childhood and adolescence to reach adult values by about 18 years. Adolescent girls are at greater physiological stress than boys because of menstruation. Their nutritional needs are of particular importance as they have to prepare for motherhood. All these rapid anabolic changes require more nutrients per unit body weight.

Growing children and adolescents particularly require more calcium. Though recommended dietary allowances for calcium are about 400-600 mg/d only, it is desirable to give higher quantities of calcium for adolescents to achieve high peak bone mass.

Table 5

EXPECTED HEIGHT AND WEIGHT FOR AGE

AGE (Years)	BOYS		GIRLS	
	Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
1.0	76.1	10.2	74.3	9.5
1.5	82.4	11.5	80.9	10.8
2.0	85.6	12.3	84.5	11.8
2.5	90.4	13.5	89.5	13.0
3.0	99.1	15.7	93.9	14.1
3.5	99.1	15.7	97.9	15.1
4.0	102.9	16.7	101.6	16.0
4.5	106.6	17.7	105.1	16.8
5.0	109.9	18.7	108.4	17.7
5.5	113.1	19.7	111.6	18.6
6.0	116.1	20.7	114.6	19.5
6.5	119.0	21.7	117.6	20.6
7.0	121.7	22.9	120.6	21.8
7.5	124.4	24.0	123.5	23.3
8.0	127.0	25.3	126.4	24.8
8.5	129.6	26.7	129.3	26.6
9.0	132.2	28.1	132.2	28.5
9.5	134.8	29.7	135.2	30.5
10.0	137.5	31.4	138.3	32.5
10.5	140.3	33.3	141.5	34.7
11.0	143.3	35.3	144.8	37.0
11.5	146.4	37.5	148.2	39.2
12.0	149.7	39.8	151.5	41.5
12.5	153.0	42.3	154.6	43.8
13.0	156.5	45.0	157.1	46.1
13.5	159.9	47.8	159.0	48.3
14.0	163.1	50.8	160.4	50.3
14.5	166.2	53.8	161.2	52.1
15.0	169.0	56.7	161.8	53.7
15.5	171.5	59.5	162.1	55.0
16.0	173.5	62.1	162.4	55.9
16.5	175.2	64.4	162.7	56.4
17.0	176.2	66.3	163.1	56.7
17.5	176.7	67.8	163.4	56.7
18.0	176.8	68.9	163.7	56.6

National Centre for Health Statistics (NCHS), (USA), Standards.



What type of diet is suitable ?

Infants should be exclusively breast-fed for the first 4-6 months. Later, they require adequate and appropriate complementary foods (vide pages 27-28).

Young children below the age of 5 years should be given less bulky foods, rich in energy and protein such as legumes, pulses, nuts, edible oil/ghee, sugar and milk and eggs. Vegetables including green leafy vegetables and seasonal fruits should be part of their daily menu. Very young children should be fed soft cooked food. New foods should be introduced one at a time and the child should be encouraged to consume the family diet. Snacks make a useful contribution to the nutrient requirements, particularly in older children and adolescents. Frequent changes in the menu are often liked by children.

Older children and adolescents should consume plenty of milk to fulfil the high calcium requirements. Cooking oils/ghee (25 g) should be consumed. Over-indulgence in fats may be avoided. Excessive salt intake should be avoided particularly by children having a family history of hypertension. Adolescence is the vulnerable stage for developing wrong food habits as well as bad habits like smoking, chewing tobacco or drinking alcohol. These should be avoided.

How do infections in children lead to malnutrition ?

Common childhood infections like diarrhoea, measles and pneumonia occur in association with malnutrition and contribute to about 70% of mortality. Proper feeding during infection is essential, which demands a lot of patience from the mother.



During periods of infection, children tend to eat less due to reduced appetite. Many children vomit frequently. Nutrients are also lost in urine and faeces. The unhealthy practice of restricting diet, including breast-feeding, by the mother during any sickness could further aggravate the problem. Hence, extra care is needed in feeding the child appropriately during and after illness to prevent subsequent nutritional deficiencies.

How should a child be fed during illness ?

Breast-feeds are often well accepted and tolerated even by sick children and should be continued except in severe gastroenteritis associated with shock. For older children, consuming an adult diet, soft cooked food may be offered at frequent intervals. The quantity of the feeds may be increased, after the illness has subsided, till the original weight is regained.

What should be done during diarrhoea ?

Diarrhoea is a common childhood disease which leads to dehydration and sometimes death. The child requires prompt correction of fluid and electrolyte loss using oral rehydration solution (ORS) along with early feeding. ORS can be prepared by adding a pinch of salt (between thumb and finger) and a teaspoon of sugar to a glass of potable water. Home-made fluids such as rice *kanji* or buttermilk with salt can also be used. During infections, children should frequently be given small quantities of fluids by mouth, including plain water.

During diarrhoea, feeding should be continued, though this goes against the popular practice. Breast-milk promotes sodium and water transport across the gut and, thus, prevents dehydration and weight loss, in addition to providing other nutrients.

The diet of 1-2 year old children with diarrhoea should provide energy of about 1000 Kcal/day. Calorie-rich, semi-solid, soft diets may be prepared from a variety of cereals and pulses. Sprouted grains are easily digestible and provide good nutrition (vide page 24). Fat and sugar help in reducing the bulk of the diets. Milk may be mixed with cereal diet to avoid lactose malabsorption. If milk is not tolerated, it may be replaced by an equal volume of curd/yogurt. Mashed vegetables may be incorporated in the diet. Feeding becomes easier after the infection subsides. About 6-8 feeds should be given during the day so that the extra food (120-140 Kcal/kg) may be consumed by the child without any difficulty.

How important is the problem of lactose intolerance ?

Deficiency of the enzyme lactase leads to lactose intolerance (vide page 55). During acute or chronic diarrhoea, lactose intolerance is a mild and transient problem. This problem can be overcome by reducing the quantity of milk taken at a time or taking milk along with a cereal-pulse meal. There is no need to stop milk in acute diarrhoea. In chronic diarrhoea, some children may develop lactose intolerance. In such children, milk may be stopped temporarily. A diet based on cereals and pulses or chicken and egg white allows the gut to recover and milk can then be slowly introduced. Adequate feeding during and after diarrhoea prevents malnutrition.

- Feed small quantities of soft cooked cereal-pulse based diets in addition to breast milk during infancy.
- Take extra care in feeding a young child and include soft cooked vegetables and seasonal fruits.
- Give plenty of milk and milk products to children and adolescents.
- Discourage overeating as well as indiscriminate dieting.

DURING ILLNESS :

- Never starve the child.
- Feed energy-rich cereal-pulse diets with milk and mashed vegetables.
- Feed small quantities at frequent intervals.
- Continue breast-feeding.
- Give plenty of fluids during illness.
- Use oral rehydration solution to prevent and correct dehydration, during diarrhoeal episodes.

EAT CALCIUM-RICH FOODS

- ◆ Calcium is needed for growth and bone development.
- ◆ Calcium prevents osteoporosis (thinning of bones).
- ◆ Osteoporosis is more common in women.
- ◆ Pregnant and lactating women, children and the elderly require more calcium.
- ◆ Milk, curds and nuts are rich sources of bioavailable calcium (raagi and GLV also provide calcium).
- ◆ Exercise reduces calcium loss from bones.

6

GREEN LEAFY VEGETABLES, OTHER VEGETABLES AND FRUITS SHOULD BE USED IN PLENTY

- Normal diet, to be wholesome and tasty, should include fresh vegetables and fruits.
- Vegetables/fruits are rich sources of micronutrients.
- Fruits and vegetables also provide several non-nutritional factors like fibre and phytochemicals of vital significance.
- Green leafy vegetables, other vegetables (yellow/orange) and fruits help in prevention of micronutrient malnutrition and certain chronic diseases.

Why should we eat vegetables/fruits ?

Vegetables (greens and others) and fresh fruits are rich sources of micronutrients such as vitamins and minerals and of complex carbohydrates/fibre. They contain abundant amounts of iron, vitamin C, folic acid, carotenoids (precursors of vitamin A) and phytochemicals. Though most Indians are vegetarians by practice, daily intake of vegetables is very low (<150 g).

What are the major micronutrients in vegetables/fruits?

Vitamin A

This fat-soluble vitamin is necessary for clear vision in dim light, and for maintaining the integrity of epithelial tissues. In vitamin A deficiency, the white of the eye (conjunctiva) loses its lustre and becomes dry. In severe vitamin A deficiency, the black of the eye (cornea) gets necrosed, leading to irreversible blindness in young children. Vitamin A also has a role in maintaining resistance of the body to common infections. Carotenoids are plentiful in fruits and vegetables that are green or deep yellow/orange in colour, such as green leafy vegetables, carrots, tomatoes, sweet potatoes, papaya, mango etc.

Iron

Iron is an essential element necessary for the formation of haemoglobin, the red pigment present in the red cells of blood. Haemoglobin plays an important role in the transport of oxygen to the tissues. Reduction in haemoglobin in blood leads to anaemia, a condition characterised by paleness and easy fatigue and increased susceptibility to infections. Iron is available in plenty in green leafy vegetables. But the absorption of iron is limited. Vitamin C rich foods must be consumed daily to improve iron absorption.

Vitamin C

Vitamin C is an essential nutrient required for healthy bones and teeth. It also promotes iron absorption. Vitamin C deficiency is characterised by weakness, bleeding gums and defective bone growth. Vitamin C is abundantly available in fresh amla, citrus fruits, guava, banana and certain vegetables such as tomatoes.

Folic acid

Folic acid is a haemopoietic vitamin essential for multiplication and maturation of red cells. Its deficiency leads to megaloblastic anaemias. Folic acid intake during pregnancy protects the foetus from developing certain congenital defects. It also promotes the birth weight of infants. Folic acid deficiency increases homocysteine levels in blood, thereby increasing the risk for heart disease. Green leafy vegetables, legumes, nuts and liver are good sources of folates.

Non-nutritional factors in vegetables and fruits

Vegetables also provide certain non-nutritional factors of considerable health significance to the human body. Among these, dietary fibre, antioxidants, and other bio-active constituents require special mention. These non-nutritional factors are required for delaying ageing and preventing the processes which lead to diseases such as cataract development, cardiovascular diseases and cancer.

Dietary Fibre

Dietary fibre delays the intestinal transit of the food consumed. Dietary fibre is important for proper bowel function and to reduce chronic constipation, diverticular disease, and haemorrhoids. The protective role of dietary fibre against colon cancer has long been recognised.

Antioxidants

In the recent past, the role of vegetables and fruits as sources of antioxidants has been receiving considerable attention. Antioxidants restrict the damage that reactive oxygen free radicals can cause to the cell and cellular components. They are of primary biological value in giving protection from certain diseases. Some of the diseases that have their origin in deleterious free radical reactions are atherosclerosis, cancer, inflammatory joint diseases, asthma, diabetes etc. Raw and fresh vegetables like green leafy vegetables, carrots, fresh fruits including citrus and tomato have been identified as good sources of antioxidants (free radical-scavengers). The nutrients vitamin C and carotenoids that are present in these vegetables are also potential antioxidants.

How much should we consume ?

The Expert Committee of the Indian Council of Medical Research, taking into consideration the nutrient requirements, has recommended that every individual should consume at least 150 g of vegetables (GLV : 40 g; Other vegetables : 60 g; Roots & Tubers : 50 g) in a day. In addition, fresh fruits (100 g), as available in different seasons, should be consumed regularly. However, for prevention of chronic diseases, the adults should consume a minimum of 300 g of vegetables and 100 g of fruits.



How to prevent cooking losses ?

Vitamins are lost during washing of cut vegetables and cooking of foodstuffs.

However, proper methods of cooking can substantially reduce these losses (vide page 52). Nutrient losses occur when the vegetables are washed after cutting into small pieces for cooking. Consumption of properly washed raw and fresh vegetables is always beneficial.

How do we get these foods ?

Green leafy vegetables (GLV), other vegetables and fruits are easily available. Most vegetables, particularly GLV, are inexpensive. In fact, these foods can be grown in the backyard with very little effort and cost. Even in lean seasons like summer, they can be grown using household waste water.

- Include green leafy vegetables in daily diet.
- Eat as much of other vegetables as possible daily.
- Consume raw and fresh vegetables as salads.
- Grow the family's requirements of vegetables in a kitchen garden.
- Green leafy vegetables, when properly cleaned and cooked, are safe even for infants.

EAT VITAMIN A RICH FOODS

- ◆ Vitamin A is needed for normal vision.
 - ◆ Vitamin A deficiency leads to night-blindness and changes in eyes.
 - ◆ Severe vitamin A deficiency leads to blindness in young children.
 - ◆ Childhood infections like diarrhoea, measles and respiratory infections and parasitic infestations reduce absorption of vitamin A through the gut.
 - ◆ Milk, eggs, liver and meat are good sources of pre-formed vitamin A.
 - ◆ Vitamin A can also be obtained from foods of plant origin in the form of beta-carotene.
 - ◆ Beta-carotene is converted to vitamin A in the body.
 - ◆ Green leafy vegetables, yellow and orange vegetables and fruits are rich sources of beta-carotene.
 - ◆ Examples of carotene-rich foods are green leafy vegetables such as drum-stick leaves, amaranth, methi, palak, vegetables and fruits like carrot, yellow pumpkin, mango and papaya.
-

COOKING OILS AND ANIMAL FOODS SHOULD BE USED IN MODERATION AND VANASPATI/GHEE/BUTTER SHOULD BE USED SPARINGLY

- Fats/oils have high energy value and provide satiety.
- Fats provide essential fatty acids and promote absorption of fat-soluble vitamins.
- Fats are precursors of biologically active compounds in the body.
- Diets that provide excess of calories, fats and cholesterol elevate blood lipids (cholesterol and triglycerides).
- Excessive fat in the diet increases the risk of obesity, heart disease, stroke and cancer.
- Ill effects of excess dietary fats are initiated early in life.

Why do we need fats ?

Both cooking oils (liquid) and solid fats are referred to as fats. Fats contribute to texture, flavour and taste, and increasing the palatability of the diet. Fats are essential for meeting some of the nutritional needs like the essential fatty acids (linoleic n-6 and α -linolenic n-3) and serve as rich sources of energy. However, fats should be consumed, in moderation though when high calorie diets are required, as in the case of young children, since cereal-pulse based diets are bulky, inclusion of adequate amounts of fat (1 g fat = 9 Kcal) in the diet can meet the need. Fats also promote absorption of the four fat-soluble vitamins (A, D, E and K), impart a feeling of fullness and satisfaction and, thus, delay the onset of hunger.

Along with proteins, fats constitute major components of body fluids and cell membranes. The two essential fatty acids (also referred as polyunsaturated fatty acids, PUFA) are metabolized at various sites in the body forming a group of biologically-active compounds, essential for several important physiological functions.

What are the sources of fat ?

Dietary fats are derived from both plant and animal sources and are classified as “visible” or “invisible” types. Fats that are used as such at the table or for cooking (vegetable oils, *vanaspati*, butter and ghee) are termed “visible” fats. Fats that are present as an integral component of different foods are referred to as “invisible” fat. Although cereals contain only 2 to 3% invisible fat, as they constitute the bulk of our diets and contribute significantly to overall fat intake. The small amounts of invisible fat present in different foods add up to a substantial level in our daily diet (about 15 g in rural population and 30 g among urban middle-income and high income groups). Most animal foods provide high amounts of invisible fat.

How much visible fat do we need ?

The total fat (invisible + visible) in the diet should provide between 15-30% total calories. Considering the physical activity and physiological status, the daily requirement of visible fat works out to 20-50 g. Adults with sedentary habits should consume about 20 g visible fat while individuals performing hard physical work require 30 g higher amounts of visible fat. Visible fat intake should be increased during pregnancy and lactation to 30 g and 45 g respectively. Diets of young children and adolescents should contain about 25 g/day. However, ingestion of too much fat is not conducive to good health.



What are the chemical components of fat ?

Fatty acids: All fats in foods are mixtures of three types of fatty acids, which are the “building blocks” of fats. Depending on the predominant fatty acids present, fats are grouped as saturated, monounsaturated and polyunsaturated. There are several fatty acids in each group. Fats from coconut oil, *vanaspathi*, animal fats (ghee and butter) and animal foods like milk, milk products and meat are mostly of the saturated type. The short and medium chain saturated fatty acids present in ghee, butter and coconut oil are easily digested and absorbed and are, therefore, good for infants and young children. However, high intake of medium chain saturated fatty acids increases atherogenic risk and their intake should be limited in adults. Oils from sources such as palm, groundnut, cottonseed, sesame and olive, are rich in monounsaturated fats as compared to other oils. Linoleic (n-6) and α -linolenic (n-3) acids are the simple PUFA which are present only in plant foods (Table 6). All vegetable oils (except coconut) are good sources of linoleic acid (n-6). α -linolenic acid (n-3) is present in only two oils (mustard and soyabean oils) and in the invisible fats present in legumes/pulses, mustard and fenugreek seeds (*methi*), and green leafy vegetables (Table 7). Fish and fish oils provide a biologically more active form of n-3 PUFA than the α -linolenic acid present in plant foods.

Table - 6

Major Types of Fatty Acids in Fats and Oils

SATURATED	MONO- UNSATURATED	POLYUNSATURATED	
Coconut Palm kernel Ghee/butter Vanaspati	Red palm oil Palmolein Groundnut Ricebran Sesame	LINOLEIC (n-6)	α -LINOLENIC (n-3)
		Low: Red palm oil, Palmolein	Mustard Soyabean
		Medium: Groundnut Ricebran Sesame	
		High: Safflower Sunflower Cottonseed Corn Soyabean	

Table - 7

Rich Sources of Alpha-Linolenic Acid (n-3)

Wheat, bajra
Blackgram, cowpea, rajmah and soyabean
Green leafy vegetables
Fenugreek and mustard seeds
Mustard oil, soyabean oil
Fish*

* Long chain n-3 PUFA - biologically active product of alpha-linolenic acid.

Dietary fats also contain minor components such as tocopherols, tocotrienols, sterols etc. The natural flavour of fats is largely due to these minor components. Since most of the minor components are antioxidants, they prevent fats from going rancid. Tocotrienols in palm oil, lignans in sesame oil and oryzanol and tocotrienols in rice-bran oil reduce blood cholesterol. Refining of oils, though does not alter their fatty acid composition, modifies the composition of minor components; for example, carotenes are lost during refining of crude palm oil.

Cholesterol: Cholesterol is present only in foods of animal origin such as milk, meat, shrimp and prawn, but not in plant foods. Egg yolk, and organ meats such as liver, kidney and brain contain very high amounts of cholesterol. Cholesterol is found in all body cells and plays a key role in the formation of brain, nerve tissue and some hormones. It is synthesized in the body and hence it is not an essential dietary component.

Higher dietary cholesterol increases blood cholesterol. The blood cholesterol-elevating effect of dietary saturated fats increases when cholesterol consumption is high. Therefore, cholesterol intake should be maintained below 200 mg/day. One method of reducing both saturated fats and cholesterol in the diet is to limit the consumption of high-fat animal foods like butter, ghee, meat, egg and organ meats and consume low fat (skimmed) milk instead of whole milk.

What are the physiological/health implications of different fats/fatty acids ?

PUFA are essential components of cell membranes. While n-6 PUFA is predominant in all cells, the nerve tissue has high levels of n-3 PUFA. An appropriate balance of the two PUFA, namely linoleic and α -linolenic acids is essential for the functioning of vascular, immune, nervous and renal systems and for early human development.

Fats/lipids (triglycerides, cholesterol and phospholipids) are transported in blood in combination with proteins in the form of 'lipoproteins'. The low density lipoproteins (LDL) transport cholesterol from liver to various tissues. High blood levels of LDL cholesterol ('bad' cholesterol) result in accumulation of lipids in the cells (atherogenic effect). High density lipoproteins (HDL) ('good' cholesterol) scavenge excess cholesterol from the tissues to the liver for degradation, and are therefore anti-atherogenic.

Saturated fats raise the levels of total and LDL cholesterol and are, therefore, atherogenic. On the other hand, monounsaturated and polyunsaturated fats reduce total and LDL cholesterol and, hence, are anti-atherogenic. The lipid (cholesterol and triglycerides) lowering and other physiological effects of individual members of the PUFA vary widely. As compared to linoleic acid, α -linolenic acid is more beneficial for prevention of inflammation, accumulation of fatty material in blood vessels (atherosclerosis) and clotting of blood (thrombosis). The n-3 PUFA of fish and fish oils have greater anti-atherogenic, anti-thrombotic and anti-inflammatory effects than the α -linolenic acid present in plant foods.

Choice of cooking oils

In view of the above, an ideal quality fat for good health is one which maintains a balance so as to give a ratio of polyunsaturated/saturated (PUFA/SFA) of 0.8-1.0, and linoleic/ α -linolenic (n-6/n-3) of 5-10 in the total diet. For ensuring this appropriate balance of fatty acids in cereal-based diets, it is necessary to increase the α -linolenic acid intake and reduce the quantity of linoleic acid obtained from the cooking oil. Hence the choice of cooking oil should be as follows:

- a) Groundnut, ricebran or sesame oils (moderate linoleic acid)
or
Soyabean oil (containing both linoleic and α -linolenic acids)
- b) Combination of two oils in approximately equal proportions: Safflower or sunflower (high linoleic acid) along with palm oil (low linoleic acid).
or
Mustard oil (contains α -linolenic acid) along with any other cooking oil (this will reduce erucic acid from mustard oil and thereby its undesirable health effects).

Use of more than one source of fat/oil has the added advantage of providing a variety of minor components in the diet. An additional way of increasing α -linolenic acid (n-3) intake is to ensure regular consumption of foods rich in α -linolenic acid (Table 7). Non-vegetarians have the further choice of eating fish to accomplish this.

What about *vanaspati* ?

Vanaspati is prepared by hydrogenation of vegetable oils. During hydrogenation, the liquid oils become solid because the monounsaturated and polyunsaturated fatty acids are converted, both to saturated fatty acids and to newer forms called *trans* fatty acids. *Vanaspati* is used as a substitute for ghee both as a cooking medium and in the preparation of bakery products, sweets and snack foods. Since saturated fats are resistant to oxidation, foods prepared in *vanaspati* keep fresh for a longer period. Current evidence indicates that some of the effects of *trans* fatty acids resemble those of saturated fatty acids and a high intake of *trans* fatty acids may increase the risk of heart disease. Therefore, it is essential to limit the intake of *vanaspati*.

- Take just enough fat.
- Use more than one source of cooking oil.
- Limit use of ghee, butter and *vanaspati*.
- Eat foods rich in α -linolenic acid (legumes, green leafy vegetables, fenugreek and mustard seeds).
- Eat fish more frequently than meat and poultry and limit/avoid organ meats (liver, kidney, brain etc).

8

OVEREATING SHOULD BE AVOIDED TO PREVENT OVERWEIGHT AND OBESITY. PROPER PHYSICAL ACTIVITY IS ESSENTIAL TO MAINTAIN DESIRABLE BODY WEIGHT

- Obesity is defined as excess accumulation of body fat.
- Obesity has several adverse health effects and can even lead to premature death.
- It increases the risk of high blood pressure, high blood cholesterol and triglycerides, heart disease, diabetes, gallstones and certain cancers.
- Obesity is not a simple consequence of overeating.
- Its psychosocial consequences are significant.

Adult man may not normally regulate his daily energy intake to balance his daily energy expenditure. If he maintains constant body weight, it indicates that he is in energy balance. Overweight and obesity are due to positive energy balance. Overeating and reduced physical activity together lead to obesity. Genetic predisposition, however, cannot be ruled out as a contributing factor. Therefore, prevention and control of obesity are directly related to dietary management and physical activity.

What is desirable or ideal body weight or body mass index ?

There is no clear definition of a desirable or ideal body weight. Ideal body weights are taken as the weight for height of insured persons with a long life span. Desirable body weights are weight for height of young adults at their best physical performance. A much simpler and more acceptable measure is the ratio of weight and height, which estimates total body mass and correlates highly with the amount of body fat. The most commonly used ratio is the body mass index or BMI (Quetlet's index). It is computed by dividing the weight in kilograms by the square of the height in meters [$BMI = \text{weight(kg)} \div \text{Height (M)}^2$]. The ideal ranges of weights for a given height are provided in Figure 2, which is useful for categorizing persons as normal (ideal), undernourished and overweight or obese.

What is obesity ?

Definition of obesity is based on the degree of excess fat. Normal (ideal) BMI ranges between 18.5 and 25. An average BMI of a population should be 21 or 22. A BMI value less than 18.5 denotes chronic under-nutrition, while that between 25-30 is considered overweight and values above 30 indicate obesity. Ideally, individuals should maintain BMI between 21 and 22 and should never exceed a BMI of 25. More than a general accumulation, the distribution of fat around the abdomen (male type obesity) is now considered to be more

harmful than fat around the hips (female type obesity). Therefore, the ratio of waist to hip circumference is an important predictor of risk of chronic degenerative diseases. A ratio of more than 0.9 in males and more than 0.85 in females is associated with increased risk of several chronic diseases. The safe ratio has not yet been determined for our population. In the absence of our own standards, the above ratios are used for our population.

Why should we avoid obesity?

There are several health consequences of obesity. Excessive body weight increases the risk of heart disease, hypertension, diabetes, gallstones, cancer and arthritis. Obesity invariably predisposes to reduced levels of high density lipoproteins ('good' cholesterol) and to increased levels of low density lipoproteins ('bad' cholesterol), and triglycerides, besides an abnormal increase in glucose and insulin in blood following an oral glucose load (insulin resistance). Considering the increasing prevalence of coronary artery disease, hypertension and diabetes in urban India, it is important to maintain desirable body weight for height and avoid obesity.

What causes obesity and when does one become obese ?

The tendency of family obesity seems to be inherited and overeating is clearly an important cause, with low physical activity being a contributing factor. Complex behavioural and



psychological factors influence the eating pattern. In addition, metabolic errors in energy utilization may favour fat accumulation. Insulin is an important modifier of energy and fat metabolism favouring fat deposition. Higher birth weight (large babies) and obesity in childhood and adolescence can lead to adult obesity. It is necessary to maintain a desirable body weight by consuming just enough calories or adjust physical activity to maintain energy balance (intake = output). Body weights must, therefore, be checked and monitored periodically.

Adults usually tend to gain weight between the ages of 25-50 years. In women, obesity develops just around pregnancy and after menopause. Over-feeding during infancy, childhood and adolescence predisposes to overweight/obesity during adulthood. The simplest and the safest way of preventing obesity in

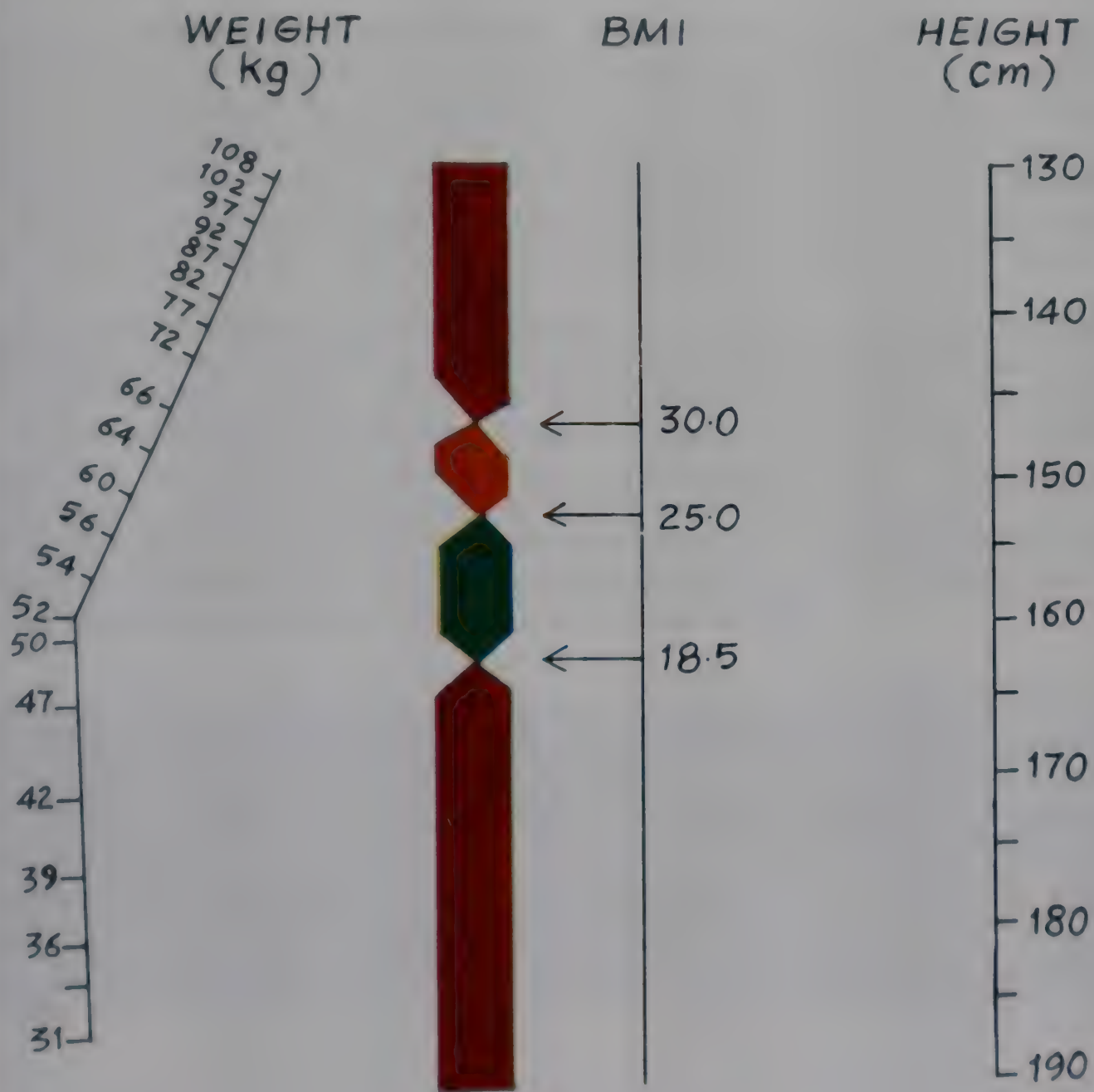


Fig.2 : NOMOGRAM DEPICTING SAFE LIMITS OF BODY WEIGHT FOR HEIGHT

Place a ruler on the height and weight scale so that the straight edge touches the desired height and weight value.

BMI < 18.5 : Undernourished (Red); 18.5 - 25 : Normal (Green);
25 - 30 : Overweight (Orange) and > 30 : Obese (Red)

infants is through breast-feeding. Physical activity and the basal metabolic rate (BMR) decrease with age and, hence, fat accumulation increases as age advances if energy intake is not suitably regulated.

How to reduce body weight ?

There is no single dietary regimen for weight reduction; it has to be individualized. Weight losing regimens should be gradual. Weight reduction diets should contain at least 800 Kcal/day and provide all nutrient requirements, except energy. Loss of half a kilogram per week is generally considered safe. Extreme approaches should be avoided and use of drugs may be dangerous. In children, obesity should be controlled by increasing physical activity rather than restricting food intake. Modifications in dietary habits have to be incorporated into one's lifestyle along with adequate exercise to keep the body weight within the normal limits.

As fat contains more than twice the calories per gram of either protein or carbohydrate, weight reducing diets should limit the fat intake. Refined sugars and alcohol provide empty calories and should be avoided. Plant foods that provide complex carbohydrates and fibre may be preferred as they reduce blood glucose, cholesterol and triglycerides. Weight-reducing diets must be rich in proteins and low in carbohydrates and fats. Consumption of plenty of fruits and vegetables would not only result in satiety but could also help to maintain adequate micronutrient intake. Frequent fasting/semi-fasting (cyclic weight reduction) followed by adequate or excess food consumption will also aggravate the problem of weight gain. All reducing regimens should be monitored by a doctor and a dietitian.

- **Slow and steady reduction in body weight is advised.**
- **Severe fasting may lead to health hazards.**
- **Enjoy a variety of foods in amounts needed to balance your physical activity.**
- **Eat small meals regularly at frequent intervals.**
- **Cut down on sugar, fatty foods and alcohol.**
- **Use low fat milk.**

TIPS FOR GOOD HEALTH

- ◆ *Exercise regularly.*
 - ◆ *Avoid smoking, chewing of tobacco and consumption of alcohol.*
 - ◆ *Check regularly for blood glucose, lipids and blood pressure after the age of 30 years.*
 - ◆ *Avoid self medication.*
 - ◆ *Adopt stress management techniques (Yoga and Meditation).*
-

9 SALT SHOULD BE USED IN MODERATION

- Sodium is the major electrolyte in the extracellular fluid.
- Sodium plays an important role in nerve conduction and fluid balance in the body.
- Maintenance of sodium balance depends on kidney function.
- High intake of salt (sodium chloride) is associated with high blood pressure and stomach cancer.
- All foods contain sodium. The sodium requirements can be met with moderate salt intake.
- Sodium intake needs to be balanced by potassium intake.

Salt is an essential ingredient of diets and enhances its taste and flavour. From time immemorial, it has been used as a preservative. All food substances contain sodium, but added salt (sodium 40%, chloride 60%) is the major source of sodium in our diet. Sodium is primarily involved in the maintenance of water balance and equilibrium. It also plays an important role in electro-physiological functions of the cell. Humans have powerful in-built mechanisms for maintaining blood pressure even on minimal sodium intake.

Sodium is rapidly absorbed from the gastrointestinal tract and a positive balance is achieved on intakes just above minimal requirements. Sodium requirements depend on its losses through urine, faeces and sweat. The sweat loss varies according to climatic conditions. High ambient temperatures and vigorous physical exercise increase sodium loss through sweat. Even after 6 hours of hard physical labour, which may generate 3 litres of sweat, the requirement of sodium chloride may not be more than 8 g/day.

Sources of sodium

Sodium content in natural diets, in general, will be about 300-400 mg a day. Cereals, pulses, vegetables, milk, animal and sea foods are the major sources of sodium. Indian data indicate that daily salt consumption ranges from less than 5 g to 30 g in different States with almost 40% of families consuming about 10 g. Since the taste for salt is an acquired habit, salt consumption should be restricted from an early age.



Preserved foods such as pickles, sun dried foods, and canned foods contribute to higher intakes of salt.

What are the health problems associated with excessive salt/sodium intake?

There is a strong association between salt intake and blood pressure. Prevalence of hypertension is low in populations consuming less than 3 g salt per day. The usual increase in blood pressure with age is also not seen with such intakes. The amount of salt consumed is reflected in urinary sodium. Drastic restriction of dietary salt decreases the risk of hypertension. However, this effect is not uniform as only 20-30% of population are salt sensitive. Potassium-rich foods such as fresh vegetables and fruits decrease blood pressure. In fact, it is the ratio of sodium to potassium in the diet which is important. Salt intakes higher than 10 g have been identified as a risk factor for hypertension.

Besides increasing blood pressure, excessive salt may also affect stomach mucosa and result in atrophic gastritis and gastric cancer.

Higher sodium intake leads to greater calcium excretion which may result in reduction in bone density. Existing evidence reveals a deleterious impact of high salt intake on blood vessels, blood pressure, bones and gastrointestinal tract. Salt intake in our population generally exceeds the requirement. It should not be more than 8 g per day. In India, salt has been identified as a vehicle for food fortification since it is the only commodity which is universally consumed.

- **Restrict the intake of added salt from an early age.**
- **Develop a taste for foods/diets low in salt.**
- **Restrict intake of preserved and processed foods like papads, pickles, sauces, ketchup, salted biscuits, chips, cheese and fish.**
- **Eat plenty of vegetables and fruits to provide adequate potassium.**
- **Use always iodized salt.**

EAT ENOUGH IODINE-CONTAINING FOODS/USE ONLY IODIZED SALT

- ◆ *Iodine is required for formation of thyroid hormones.*
 - ◆ *Thyroid hormones are necessary for growth and development.*
 - ◆ *Iodine deficiency leads to goitre (enlargement of thyroid gland)*
 - ◆ *Lack of iodine in the water and diet is the main cause of iodine deficiency disorders.*
 - ◆ *Iodine deficiency during pregnancy results in still births, abortions and cretinism.*
 - ◆ *Use of iodized salt ensures adequate iodine intake.*
-

- Safe and good-quality food is essential for maintaining good health.
- Naturally-occurring toxins, environmental contaminants and adulterants in foods constitute a health hazard.
- Consumption of unsafe foods can lead to food-borne diseases.

What makes food unsafe ?

Microbes (bacteria and moulds) and their products are responsible for food spoilage. Natural enzymes present in food also lead to its deterioration. Besides, insects and rodents, adulterants, natural toxins and various chemical residues beyond permissible levels, make the food unwholesome. In addition to moisture and environmental conditions like temperature, storage time also influence the quality of the food.

How do we select safe food?

Selection of the right food is the first step to ensure safe and good quality diet. Food items purchased from reliable sources having a high turnover ensure their freshness. Some foods carry certification mark assuring good quality. For example AGMARK for honey and ghee; FPO (Fruit Products Order) for fruit and vegetable products (jams, squashes, etc); ISI (Bureau of Indian Standards) for food colours and essences.

Food grains purchased should be free from foreign matter and infestation (rodent excreta and insect remains). They should be of uniform size and should not be shrivelled, shrunken and mouldy. Foodstuffs should be free from artificial colours. There is a risk of adulteration when fats/oils are purchased loose from unsealed containers. Therefore, it is always safer to purchase reputed brand products in sealed sachets/containers. It is necessary to buy pasteurized milk in sachets from a reputed dairy or a reliable vendor to avoid the risk of adulteration and contamination. Milk products such as butter, ghee and *khoa* should also be purchased from reliable sources. Whole spices, uniform in colour, size and shape should be preferred. Since powdered spices are more likely to be adulterated, always buy certified products. Fruits and vegetables that show patches, mechanical damage and bruises, or are wilted and decayed with visible evidence of insects and moulds, should be avoided. Eggs should be fresh and free from cracks. Meat or poultry must be examined for characteristic colour, odour and texture, and should be purchased fresh or frozen. Freshness of fresh-water fish is indicated by a stiff body, bright, clear and bulging eyes, reddish gills, tight scales and absence of stale odour or discolouration. Fresh fish will not show any pitting on finger pressure.

What are the best practices of storage ?

Agricultural commodities should be dried adequately and protected from moisture in a safe storage structure (eg. tin with a tight lid) to prevent damage from moulds. Microbes like bacteria and mould produce toxins (eg. aflatoxins). Rodent attacks, and the presence of insects and microbes, not only reduce the availability of nutrients but render the foods harmful. Frequent and careful disinfestation of the storage premises using pesticides like aluminium phosphide is essential. Some traditional household practices such as application of edible oils to grains, placing dried neem leaves in storage bins etc., are known to prevent infestations.

Why do foodborne diseases occur?

Foodborne infections and toxicities are common particularly with consumption of susceptible foods such as milk products like *khoa*, meat, poultry and even cooked foods like rice. Improper processing, handling and cooking, and keeping cooked foods in warm conditions for several hours before eating, promote bacterial growth and toxin production.

How should perishable foods be handled ?

Perishable foods like milk, meat, vegetables and cooked foods, are prone to spoilage due to microbes. These foods should be stored under refrigeration, preferably at a temperature of 10°C or less, which retards multiplication of microorganisms. However, even refrigerated foods, if stored for long, can get spoiled. Cross contamination can be avoided by keeping cooked and raw food separately.

In case food which is cooked has to be stored for some time, it should be kept either hot (more than 60°C) or be cooled quickly (below 10°C). Most micro-organisms multiply at temperatures between 10 and 60°C. Refrigerated cooked food should be heated before consumption. However, repeated heating may be avoided.

What about personal hygiene ?

Food handlers should observe good personal hygiene to maintain food safety. They should be free from obvious signs of illness, wounds and sores. Traditionally in India, cooked food is touched by the hands while preparing, serving and eating. Use of spoons and ladles should be encouraged to avoid contamination. Hands should be washed thoroughly before starting the preparation of food and after every interruption. Household pets like cats and dogs often harbour dangerous pathogens. They should be kept away from places where food is cooked, stored or served.

What are the common adulterants ?

Foods may be adulterated with non-food material or inferior quality product. Spoilt, stale or poor quality food is made attractive and fresh by adding harmful colours or other chemicals. Frequently adulterated food items are milk and milk products, cereals, pulses and their products, edible oils and spices. The different classes of adulterants include non-permitted

colours like metanil yellow; non-edible oils like castor oil; cheaper agricultural produce like various starches in milk powder; extraneous matter like husk, sand and sawdust; and metal contaminants like aluminium or iron filings. Consumption of adulterated foods could lead to disease outbreaks of epidemic proportions. Buying from a reliable and reputed source, careful checking of foods before purchase and insisting on certified brands will all minimize the risk of food adulteration.

How to minimize effects of pesticide residues ?

Pesticides, used during cultivation of crops, can remain as residues in foodstuffs, especially vegetables and fruits. Exposure of the population to pesticide residues may be harmful and can be minimized by washing the foodstuffs thoroughly in running water or by peeling. Cooking and other processes can also reduce such residues. Insect control operations such as disinfestation in the kitchen by spraying pesticides is another source of contamination. Utmost care should be taken to ensure that eatables are well covered and protected from exposure to such harmful agents.



- Buy food items from reliable sources after careful examination.
- Wash vegetables and fruits thoroughly before use.
- Store the raw and cooked food properly and prevent microbial, rodent and insect invasion.
- Refrigerate perishable food items till consumption.
- Maintain good personal hygiene and keep the cooking and food storage areas clean and safe.

HEALTHY AND POSITIVE FOOD CONCEPTS AND COOKING PRACTICES SHOULD BE ADOPTED

- Cultural factors play an important role in dietary practices.
- Faulty food beliefs and faddism adversely affect nutrition and health.
- Cooking renders food palatable and helps in easy digestion.
- Cooking destroys harmful germs.
- Faulty cooking habits lead to loss of nutrients.
- Cooking at high temperatures leads to destruction of nutrients and formation of harmful substances.

What are common Indian food beliefs, fads and taboos ?

Food habits are formed early in childhood, passed on from the elders in the family and perpetuated into adulthood. Food beliefs either encourage or discourage the consumption of particular foods. There can be neutral, harmless or harmful practices. Unfortunately, most of the harmful beliefs and prejudices (taboos) are associated with the diets of women and children, who are also the most vulnerable to malnutrition. Exaggerated beneficial or harmful claims in respect of some foods, without scientific basis constitute food fads. In addition, the concept of hot and cold foods is widely prevalent. Hot foods are believed to produce heat in the body. Some examples are jaggery, sugar, groundnuts, fried foods, mango, bajra, jowar, maize, eggs and meat. Papaya fruit is strongly suspected to lead to abortion, though there is no scientific basis. In fact, these foods should be particularly consumed during pregnancy. Buttermilk, curd, milk, green gram dhal, green leafy vegetables, ragi, barley flour and apples are considered as cold foods which are actually nutritious. Vegetarianism is often practised in India on religious grounds. Since vitamin B₁₂ is present only in foods of animal origin, vegetarians should ensure an adequate consumption of milk. During certain illnesses like measles and diarrhoea, dietary restriction is practised. This can aggravate malnutrition in young children.

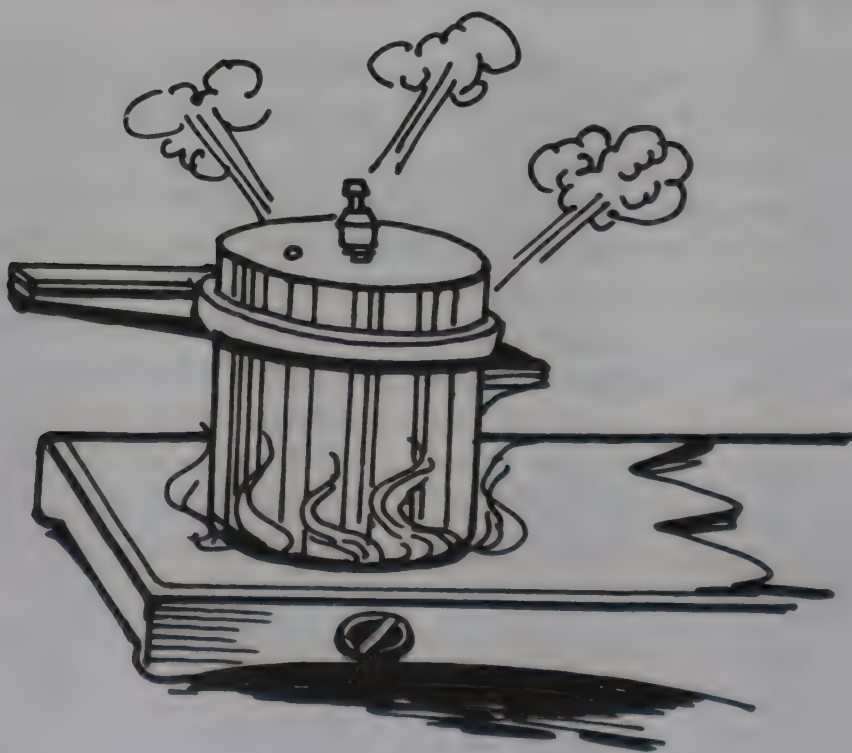
What are the effects of the precooking process ?

Foods, in their natural state, contain different nutrients in varying amounts. Cooking improves the digestibility of most foods. Flesh foods get softened and easily chewable. Proper methods of cooking render foods palatable by improving the appearance, taste, flavour and texture, thereby enhancing acceptability. In addition, they help in destroying disease causing organisms and eliminating natural inhibitors of digestion. In the course of

dietary preparation, depending on the recipe, foods are subjected to various processes such as washing, cutting, fermentation, germination and cooking. In the Indian cuisine, fermentation (*idli, dosa, dhokla*) and germination (sprouting) are common practices. These methods improve digestibility and increase nutrients such as B-complex vitamins and vitamin C.

What are the effects of washing and cutting ?

Foods should be washed well before cooking and consumption to remove contaminants like pesticide residues, parasites and other extraneous material. However, certain precautions need to be taken while washing and cutting to minimize the loss of nutrients. Repeated washing of foodgrains like rice and pulses results in losses of certain minerals and vitamins. Vegetables and fruits should be washed thoroughly before cutting. Cutting of vegetables into small pieces exposes a greater surface area of the foodstuff to the atmosphere, resulting in loss of vitamins due to oxidation. Therefore, vegetables should be cut into large pieces. Cut vegetables should not be soaked in water for long, as water-soluble minerals and vitamins get dissolved. Water in which the food grains and vegetables have been soaked should not be discarded but put to use to prevent nutrient loss.



What are the effects of cooking ?

There are many methods of cooking like boiling, steaming, pressure cooking, frying, roasting and baking. Boiling is the most common method of cooking, during which heat-labile and water-soluble vitamins like vitamins B-complex and C are lost. The practice of

using excess water while cooking rice should be discouraged since it leads to loss of vitamins; just sufficient water to be fully absorbed should be used. Vegetables should be cooked on low heat using just adequate water in a covered vessel to preserve flavour and nutrients and to reduce cooking time. Use of baking soda for hastening cooking of pulses should not be practised, as it results in loss of vitamins. Frying involves cooking food in oil/ghee/*vanaspati* at high temperatures. Shallow frying involves use of much smaller amounts of oils than deep frying. Repeated heating of oils particularly PUFA-rich oils, results in formation of peroxides and free radicals and, hence, should be avoided by using just enough oil. Similarly, oils which have been repeatedly heated should not be mixed with fresh oil but should be used for procedures such as seasoning.

- **Avoid food faddism and discard erroneous food beliefs.**
- **Do not wash foodgrains repeatedly before cooking.**
- **Do not wash vegetables after cutting.**
- **Do not soak the cut vegetables in water for long periods.**
- **Do not discard the excess water left over after cooking.**
- **Cook foods in vessels covered with lids.**
- **Prefer pressure/steam cooking to deep frying/roasting.**
- **Encourage consumption of sprouted/fermented foods.**
- **Avoid use of soda while cooking pulses and vegetables.**
- **Do not heat the left over oil repeatedly.**

WATER SHOULD BE TAKEN IN ADEQUATE AMOUNTS AND BEVERAGES SHOULD BE CONSUMED IN MODERATION

- Water is the major constituent of the human body.
- Beverages are useful to relieve thirst and to meet fluid requirements of the body.
- Some beverages provide nutrients while others act as stimulants.
- Milk is an excellent beverage for all age groups as it is a rich source of nutrients.

Why do we need water ?

Water accounts for 60% of our body weight. It is a constituent of blood and other vital body fluids. Water plays a key role in elimination of body wastes and regulation of body temperature. The body loses water through sweat, urine and faeces. This loss must be constantly made good with clean and potable water. A normal healthy person needs to drink about 5 glasses (1 litre) of water per day. During very hot weather and while undertaking vigorous physical activity, this requirement increases as a considerable amount of water is lost through sweat.

When is water considered safe and wholesome ?

Water should be safe and wholesome i.e., it should be free from disease-causing agents like bacteria, parasites, viruses etc., and harmful chemical substances like pesticides, industrial wastes, heavy metals, nitrates and excess of fluoride. Fluorosis, a disease with bone deformities and dental problems, results from drinking water containing an excess of fluoride over long periods. Generally, a concentration of 0.5 to 0.8 mg of fluoride per litre of drinking water is considered safe.

How is water rendered safe ?

If a water source is not safe for drinking, boiling it for 10-15 minutes is a satisfactory method of purification of the water. It kills all disease-causing organisms and also removes temporary hardness. However, boiling will not remove other chemical impurities. Tablets containing 0.5 g of chlorine can disinfect 20 litres of water. There are many modern gadgets which claim to provide safe and wholesome water. However, they vary in efficacy.

How nutritious is milk ?

Milk is a well accepted and wholesome food and beverage for all age groups. It contains most of the nutrients necessary for growth and development. It is, therefore, specially useful

for feeding infants, toddlers, growing children and expectant women and nursing mothers. All the macro- and micro-nutrients are present in an easily digestible and assimilable form in milk. Milk proteins possess high biological value which is almost equal to that of meat, eggs and other high-quality animal proteins. Milk proteins are valuable supplements to most vegetarian diets.

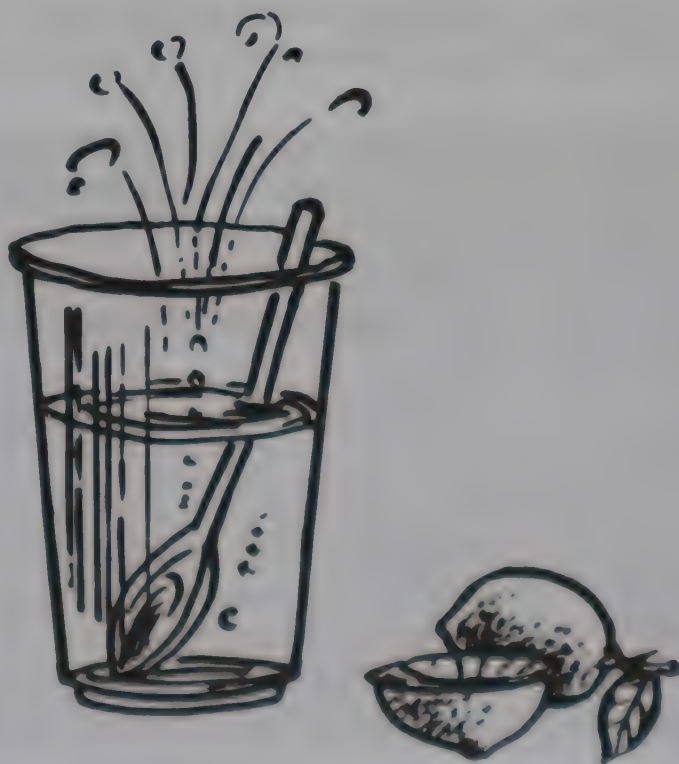
Milk is a rich source of bioavailable calcium which helps in the building up of strong bones. Milk fat serves as a vehicle for important fat-soluble vitamins A, D and E. Since milk fat is of the saturated type, those who have to be on a low fat diet can consume skimmed/toned milk. For strict vegetarians, milk is the only source of vitamin B₁₂. Milk is also rich in riboflavin, but is a poor source of vitamins C, D and iron. However, only pasteurized or boiled milk should be consumed to ensure protection from disease-causing agents.

What is lactose intolerance ?

Lactose, the sugar present in milk, helps in the establishment of lactic acid bacteria in the intestinal tract. If lactase, an enzyme required for digestion of lactose, is not present in sufficient amounts, such individuals develop abdominal symptoms on consumption of excess of milk. This is common in children following diarrhoea and is described as lactose intolerance. Drinking small quantities of milk at a time does not usually cause any gastrointestinal problems and there is no need to discourage intake of milk by children except in severe cases.

What are soft drinks ?

Soft drinks are generally of two categories : natural soft drinks and artificial or synthetic soft drinks. Water is the main constituent of all beverages. Orange, lemon, grape, mango, pineapple and apple are generally used in making fruit juice. Cane sugar juice is also extensively used in India, particularly during summer. Natural fruit juices provide in addition to energy, some vitamins (beta carotenes, vitamin C) and minerals (potassium, calcium). Fruit juices are ideal beverages for hypertensives as they are rich in potassium. However, they cannot be equated with fruits which also provide dietary fibre.



Compared to natural fruit juices, synthetic drinks do not contain nutrients unless they are fortified. Generally, synthetic drinks are prepared using preservatives, artificial colours

and flavours such as cola, orange, mango and lime, and frequently they are carbonated. Cola drinks contain phosphoric acid and may damage the enamel of teeth, and affect appetite if taken in excessive amounts. Water used for preparation of beverages should be free from disease-causing agents and harmful chemical impurities.

What about tea and coffee ?

Tea and coffee are popular beverages. They are known to relieve mental and muscular fatigue. This characteristic stimulating effect is due to their caffeine content. A cup (150 ml) of brewed coffee contains 80-120 mg of caffeine and instant coffee 50-65 mg, while tea contains 30-65 mg of caffeine. Caffeine stimulates the central nervous system and induces physiological dependence. Generally, low doses (20-200 mg) of caffeine produce mild positive effects like a feeling of well-being, alertness and energy. Higher doses (>200 mg) can produce negative effects like nervousness and anxiety, especially in people who do not usually consume caffeine-containing beverages. Therefore, moderation in tea and coffee consumption is advised so that caffeine intake does not exceed the tolerable limits. Tannin is also present in tea and coffee and is known to interfere with iron absorption. Accordingly, tea and coffee should be avoided at least for one hour before and after meals.

Coffee consumption is known to increase blood pressure and cause abnormalities in heart beat. In addition, an association between coffee consumption and elevated levels of total and LDL cholesterol ('bad' cholesterol), triglycerides and heart disease has been demonstrated. Therefore, individuals with heart disease need to restrict coffee consumption. Also, those who experience adverse effects from caffeine should stop drinking coffee.

Besides caffeine, tea contains theobromine and theophylline. These are known to relax coronary arteries and thereby promote circulation. Tea also contains flavonoids and other antioxidant polyphenols, which are known to reduce the risk for coronary heart disease and stomach cancer. However, as a result of its caffeine content, excess tea consumption is deleterious to health. Decaffeinated coffee and tea are being marketed to obviate the adverse effects of caffeine.

Alcohol

Alcoholic beverages contain ethyl alcohol in varying proportions. Beer contains 2-5% and wine 8-10% of alcohol while brandy, rum and whisky contain much higher concentrations (30-40%). Alcohol has been extensively abused as an appetite stimulant and as a sedative-hypnotic drug. Alcohol intake, which is initiated as an innocent social habit, gradually results in a serious addiction. It may lead to several serious psycho-social problems and accidents.

Alcohol provides higher calories (7 Kcal/g) than carbohydrates and proteins and, thus, can contribute to obesity. Ironically, excessive intake of alcohol is known to suppress appetite and interfere with absorption and metabolism of nutrients, leading to various nutritional deficiency diseases.

Excessive intake of alcohol suppresses appetite and as a result, leads to several nutritional deficiency diseases. People who regularly consume more than two alcoholic drinks (about 30 ml of ethanol) are at a higher risk for hypertension and stroke. Alcohol intake has also been shown to increase the risk of cancer of the mouth, larynx and oesophagus, prostate and of the breast in women. Excessive alcohol intake weakens the heart muscle (cardiomyopathy) and also damages the liver (cirrhosis), brain and peripheral nerves. It also increases serum triglycerides.

Should alcohol consumption be encouraged for protection from coronary heart disease?

Alcohol in small doses (350 ml of beer, 45 ml of whisky, 70 ml of wine) increases HDL (good) cholesterol. The flavonoids and antioxidants present in wine prevent oxidation of LDL cholesterol and offer protection against coronary heart disease (CHD). Though moderate intake of alcohol reduces the risk of CHD, alcohol consumption should neither be encouraged nor recommended for those who are not habituated to it just for the sake of reducing the risk of heart disease.

- Drink enough of safe and wholesome water to meet daily fluid requirements.
- Drink boiled water, when safety of the water is in doubt.
- Consume at least 250 ml of boiled or pasteurized milk per day.
- Drink natural and fresh fruit juices instead of carbonated beverages.
- Prefer tea over coffee.
- Avoid alcohol. Those who drink, should limit its intake.

PROCESSED AND READY-TO-EAT FOODS SHOULD BE USED JUDICIOUSLY. SUGAR SHOULD BE USED SPARINGLY.

- Urbanization has increased the intake and demand for processed foods.
- There is a trend towards replacing traditionally cooked foods with processed foods.
- Processed foods contain a variety of food additives.
- Processed foods may not be nutritionally balanced unless fortified.
- Sugar, a processed food, provides empty calories.

What are processed foods ?

Foods that are subjected to technological modifications either for preservation or for converting into ready-to-use/eat foods, eliminating laborious household procedures, are called "processed foods". Some of the examples are ready mixes, dehydrated foods, pasta products, canned foods, confectioneries, bakery, dairy products and breakfast foods. Manufacture of processed foods requires technology and machinery, and as a result, processed foods are expensive. Manufacture of processed foods is on the increase in the unorganized, small-scale and cottage-industry sectors and these products may not always be in conformity with food standards.



Do we need processed foods ?

There is an increased demand for processed, ready-to-eat and convenience foods due to changes in lifestyle. As more and more women go to work outside, and families become nuclear, consumption of processed foods, particularly in urban areas, will be on the increase. Today's consumer is looking for convenient, easy-to-cook, and ready-to-eat foods which require less time to prepare than traditional home-cooked foods.

Do processed foods contribute to nutrient intake ?

Processed foods are generally consumed either as part of a meal, or as a snack item. Their contribution in terms of essential nutrients depends on the type of processing and fortification, the frequency of use, and the quantity consumed. Processed foods are generally refined and a majority of them are rich in fat or in salt/sugar, and are calorie dense. They lack dietary fibre and micronutrients. Thus, caution needs to be exercised when processed foods constitute a major part of the meal.

Breakfast cereals are increasingly being used in urban areas. They are expensive. In contrast, traditional breakfast items like *idli*, *dosa*, *upma* and *roti* are richer sources of nutrients. Puffed and parched rice products (eg. flaked rice) besides being crisp and tasty, are easily digestible. Food items like chips, candies, peppermints, chocolates, etc., which are popular among children, are considered as junk foods since they provide only empty calories often containing artificial colours and other additives. Their use should be discouraged.

Why should we restrict intake of processed foods ?

Frequent consumption of processed food will depress appetite, thereby reducing the consumption of normal nutritious diet. Apart from not being nutritious, processed foods also contain various food additives. Food additives consumed beyond permissible limits may have adverse effects on health. The national food regulatory authorities periodically review these limits. It is important to remember that even small amounts of different additives, when obtained through a variety of processed foods, can substantially contribute to the burden of foreign chemicals in the body. When various processed foods are consumed regularly as part of our daily diet, there is a danger of the level of intake of these additives going beyond the specified safe level, which could result in a health risk to the consumer. Thus, consumption of processed foods may not only affect intake of nutrients, but in addition, increase the risk of exposure to various chemical additives.

In the coming years, with larger constraints on time in the home, demand for processed foods is certain to increase. Care is necessary to see that a nutritionally sound diet is not compromised through unwise intake of various processed and convenience foods. Processed vegetables and fruits which are currently available, cannot be equated with fresh vegetables and fruits.

Why should we moderate intake of sugar ?

Sugars occur both naturally and as an ingredient in many foods. They are present in natural foods like fruits, vegetables, milk and honey. Added sugars provide taste and texture to foods. Sugar is present in processed foods like chocolates, jams, ice-creams and soft drinks. The most familiar sugar is sucrose. Refined or table sugar (sucrose) provides “empty calories”. Foods such as cakes, pastries, confectionery and sweets often have high amounts of fat, and sugar, and are prepared with refined cereals. Consumption in excess of sugary foods may lead to obesity and elevated blood lipids. Children overindulging in chocolates and candies are prone to dental caries. For prevention of diet-related chronic diseases, sugars and refined cereals should be used sparingly.

- **Prefer traditional, home made foods.**
- **Avoid processed snack foods at meal times.**
- **Limit consumption of sugar and processed foods which provide only (empty) calories.**
- **Prefer fortified processed foods.**
- **Limit intake of processed foods to decrease load of food additives on the body.**
- **Always look for information on the food label (given on containers) regarding shelf-life and the additives used.**

THE ELDERLY SHOULD HAVE A NUTRIENT RICH DIET TO KEEP FIT AND ACTIVE

- The elderly have a reduced need of calories.
- The elderly are more prone to diseases due to lowered food intake, physical activity and resistance to infection.
- Good food habits and regular exercise minimise the ill-effects of ageing.
- The elderly need more calcium, iron, zinc, vitamin A and antioxidants to prevent age-related diseases.

Who is an elderly person ?

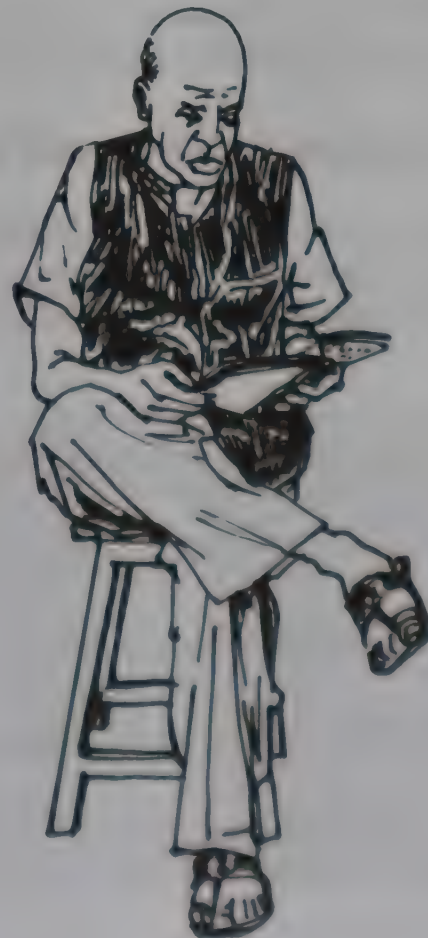
Individuals above the age of 60 years constitute the elderly. In India, the elderly constitute about 7 per cent of the total population and by 2016 AD, this likely to increase to 10 per cent.

How are the elderly different?

With ageing, several physiological and metabolic changes occur. Metabolism, physical activity, digestion, bone and muscle strength all decline. Failing eye-sight and impaired hearing may also occur. Low appetite as a result of decreased physical activity and dental problems could lead to overall decrease of food intake and poor absorption of nutrients. Inability to prepare food, decreased purchasing capacity and psycho-social problems adversely affect the health and nutritional status of the elderly.

How can the elderly lead an active life?

Consumption of simple nutritious food will enable the elderly to live active and meaningful lives, without being a burden on society and their family members. Uncomplicated ageing can also be quite



productive, say in the domestic sphere. Younger people can often benefit from the long and rich experience of the elderly.

What are the common diseases among the elderly ?

Resistance to disease declines in the elderly. The common ailments in the elderly are degenerative diseases such as arthritis (joint diseases), osteoporosis, cataract, diabetes, cardiovascular problems (stroke and heart diseases), neurological diseases (Parkinson, Alzheimer) and cancer. Besides these, respiratory and urinary tract infections may also occur.

What type of diet should the elderly eat ?

As people grow older, they tend to become physiologically less active and therefore need fewer calories to maintain their weights. The daily intake of oil should not exceed 20 g. Use of ghee, butter, *vanaspati* and coconut oil should be avoided. They need foods rich in protein such as pulses, toned milk, egg-white etc. The elderly population are prone to various nutritional deficiencies. Low intakes of calcium, micro-nutrients and fibre are common. Therefore, the elderly need nutrient-rich foods. Apart from cereals and pulses, they need daily at least 200-300 ml of milk and milk products and 400 g of vegetables and fruits to provide fibre, micro-nutrients and antioxidants. Inclusion of these items in the diet improves the quality of the diet and bowel function. Flesh foods and eggs add to the quality of diet.

The diet needs to be well cooked, soft and less salty and spicy. Small quantities of food should be consumed at more frequent intervals.

How can elderly remain fit and active ?

Exercise is an integral part of maintaining healthy life. It helps to regulate body weight. The risk of degenerative diseases is considerably decreased by regular exercise. Exercise schedule should be decided in consultation with a physician.

- Eat a variety of nutrient-rich foods to keep fit.
- Match food intake with physical activity.
- Eat food in many divided portions in a day.
- Avoid fried, salty and spicy foods.
- Exercise regularly.

ANNEXURES

1. Recommended Dietary Allowances
 - Macronutrients and Minerals
 - Vitamins
2. Some Nutrient Rich Foods
3. Portion Sizes for Menu Plan
4. Exercise and Physical Activity

RECOMMENDED DIETARY ALLOWANCES FOR INDIANS
(Macronutrients and Minerals)

Group	Particulars	Body Wt. kg	Net Energy Kcal/d	Protein g/d	Fat g/d	Calcium mg/d	Iron mg/d
Man	Sedentary work		2425				
	Moderate work	60	2875	60	20	400	28
	Heavy work		3800				
Woman	Sedentary work		1875				
	Moderate work	50	2225	50	20	400	30
	Heavy work		2925				
	Pregnant woman	50	+300	+15	30	1000	38
	Lactation						
	0-6 months	50	+550	+25	45	1000	30
	6-12 months		+400	+18			
Infants	0-6 months	5.4	108/kg	2.05/kg		500	
	6-12 months	8.6	98/kg	1.65 kg			
Children	1-3 years	12.2	1240	22			12
	4-6 years	19.0	1690	30	25	400	18
	7-9 years	26.9	1950	41			26
Boys	10-12 years	35.4	2190	54	22	600	34
Girls	10-12 years	31.5	1970	57			19
Boys	13-15 years	47.8	2450	70	22	600	41
Girls	13-15 years	46.7	2060	65			28
Boys	16-18 years	57.1	2640	78	22	500	50
Girls	16-18 years	49.9	2060	63			30

RECOMMENDED DIETARY ALLOWANCES FOR INDIANS
(Vitamins)

Group	Particulars	Vit.A µg/d		Thia- min mg/d	Ribo- flavin mg/d	Nico- tinic acid mg/d	Pyri- doxin mg/d	Ascor- bic acid mg/d	Folic acid µg/d	Vit. B ₁₂ µg/d
		Reti- nol	β- caro- tene							
Man	Sedentary work			1.2	1.4	16				
	Moderate work	600	2400	1.4	1.6	18	2.0	40	100	1
	Heavy work			1.6	1.9	21				
Woman	Sedentary work			0.9	1.1	12				
	Moderate work	600	2400	1.1	1.3	14	2.0	40	100	1
	Heavy work			1.2	1.5	16				
	Pregnant woman	600	2400	+0.2	+0.2	+2	2.5	40	400	1
	Lactation									
	0-6 months	950	3800	+0.3	+0.3	+4	2.5	80	150	1.5
	6-12 months			+0.2	+0.2	+3				
Infants	0-6 months			55µg/kg	65µg/kg	710µg/kg	0.1			
	6-12 months	350	1200	50µg/kg	60µg/kg	650µg/kg	0.4	25	25	0.2
Children	1-3 years	400		0.6	0.7	8			30	
	4-6 years	400	1600	0.9	1.0	11	0.9	40	40	0.2-1.0
	7-9 years	600	2400	1.0	1.2	13	1.6	60		
Boys Girls	10-12 years			1.1	1.3	15				
	10-12 years	600	2400	1.0	1.2	13	1.6	40	70	0.2-1.0
Boys Girls	13-15 years			1.2	1.5	16				
	13-15 years	600	2400	1.0	1.2	14	2.0	40	100	0.2-1.0
Boys Girls	16-18 years			1.3	1.6	17				
	16-18 years	600	2400	1.0	1.2	14	2.0	40	100	0.2-1.0

SOME NUTRIENT-RICH FOODS

Nutrients	Food Groups	Foods	Nutrient Content Unit/100 g edible portion
Energy	Cereals and Tubers	Rice, wheat and tapioca	340 Kcal
	Nuts and Oilseeds	Almond, cashewnut, dry coconut and groundnut	600 Kcal
	Vegetable oil, ghee and <i>Vanaspati</i>		900 Kcal
Protein	Pulses and Legumes	Bengalgram, blackgram, greengram, lentil and redgram	22 g
	Nuts and Oilseeds	Groundnuts, cashewnuts and almond	23 g
	Fish		20 g
	Meat and Poultry	Meat Egg white	22 g 11 g
	Milk products	Cheese, <i>khoa</i> , skimmed milk powder (cow) and whole milk powder (cow)	30 g
Beta-Carotene	Leafy vegetables	<i>Ambat chukka</i> , coriander leaves, <i>ponnaganti</i> , spinach, leaves, mint, radish leaves Some other leafy vegetables like agathi, amaranth, curry leaves, fenugreek leaves and <i>gogu</i>	2-6 mg 7-15 mg.
	Other vegetables	Pumpkin and green chillies Carrot	1 mg 6.5 mg

Nutrients	Food Groups	Foods	Nutrient Content Unit/100 g edible portion
Folic Acid	Fruits	Ripe mango	2.0 mg
		Papaya	0.9 mg
	Green leafy vegetables	Amaranth, <i>ambat chukka</i> , mint and spinach	120 µg
	Pulses	Bengalgram, blackgram, greengram and redgram	120 µg
Iron	Oilseeds	Gingelly and soyabean	180 µg
	Green leafy vegetables	Amaranth, bengalgram leaves, cauliflower greens and radish leaves	18-40 mg
Calcium	Cereals and Legumes	Ragi, bengalgram (whole), horsegram (whole), rajmah and soyabean	200-340 mg
	Green leafy vegetables	Amaranth, cauliflower greens, curry leaves, knol-khol leaves	500-800 mg
		Agathi	1130 mg
		Colocasia leaves	1540 mg
	Nuts and Oilseeds	Coconut dry, almond, mustard seeds and sunflower seeds	130-490 mg
		Gingelly seeds	1450 mg
		Cumin seeds	1080 mg
	Fish	Bacha, katla, mrigal, pran and rohu	320-650 mg
	Milk and Milk Products	Buffalo's milk, cow's milk, goat milk, curds (cow's)	120-210 mg

Nutrients	Food Groups	Foods	Nutrient Content Unit/100 g edible portion
Vitamin C	Green leafy vegetables	Cheese, <i>khoa</i> , skimmed milk powder and whole-milk powder	790-1370 mg
		Agathi, cabbage, coriander leaves, drumstic leaves, knol-khol greens	120-220 mg
	Other vegetables	Giant chillies (<i>capsicum</i>)	137 mg
		Green chillies	117 mg
	Fruits	Amla Guava	600 mg 212 mg
Fibre	Pulses and Legumes	Wheat, jowar, bajra, ragi, maize, legumes, dhals and fenugreek seeds	>10 g
Vitamin A	Fats and edible oils	Butter, ghee (cow) and hydrogenated oil (fortified)	700 µg
Riboflavin	Cereal grains and products	Bajra, barley, ragi, wheat germs and wheat bread (brown)	0.2 µg
	Pulses and legumes	Bengalgram, blackgram, greengram, lentil, red-gram and soyabean	0.2 mg
	Leafy vegetables	Amaranthus, carrot leaves, colacasia leaves, curry leaves, fenugreek leaves, gogu, mint, radish leaves and spinach	0.25 mg

Nutrients	Food Groups	Foods	Nutrient Content Unit/100 g edible portion
	Nuts and Oilseeds	Gingelly seeds, mustard seeds, niger seeds, sunflower seeds, almond and walnut	0.3 mg
	Condiments and spices	Chillies dry, chillies green, coriander and cumin seeds	0.35 mg
	Fruits	Apricot dried and papaya	0.23 mg
	Meat and poultry	Egg (hen) Sheep liver	0.26 mg 1.7 mg
	Milk and milk products	Skimmed milk powder and whole milk powder (cow's milk)	1.5 mg

NAMES OF LEAFY VEGETABLES IN INDIAN LANGUAGES

A-Assamese; B-Bengali; G-Gujarati; H-Hindi; Kan-Kannada; Kash-Kashmiri; Mal-Malayalam; Mar-Marathi; O-Oriya; P-Punjabi; Tam-Tamil; Tel-Telugu.

1. Agathi : *Sesbania grandiflora*.
B. Bak; G. Agathio; H. Mar, O. Agasti; Kan. Agase; Mal., Tam. Agathi; Tel. Avise; Other names: Basna; Agathi.
2. Amaranth, tender: *Amaranthus gangeticus*.
B. Notya; H. Chaulai sag; Kan. Dantu; Mal. Cheera; Mar. Math; Tam. Thandukeerai; Tel. Thotakoora; Other names: Gogta sag, Arikisira.
3. Ambat Chuka: *Rumex vesicarius*.
B. Chuka palang; H. Chuka; Kash. O'bej; Kan. Sukkisoppu, Mar. Ambat chuka; Tam. Chukka Keerai; Tel. Chukka Koora; Other names: Khatti palak.
4. Bengal gram leaves: *Cicer arietinum*.
B. Chola sag; G. Chanapan; H. Chana sag; Kan. Kadale soppu; Mal. Kadala ilagal; Mar. Harbara pan; O. Chana saga; P. Chholianda sag; Tam. Kadalai ilaigal; Tel. Sanaga akulu.
5. Cabbage: *Brassica oleracea var. capitata*.
B., O. Bandha kopee; G., Mar. Kobi; H., Kash. Band gobee; Kan. Kosu; Mal. Mutta gose; Tam. Muttaikose; Tel. Gos Koora; Other name: Pat gobee.

6. Carrot leaves: *Daucus carota*.
B., H. Gajar sag; G., Mar. Gajar pan; Kan. Gajri soppu; Mal. Carrot ilagal; O. Gajara patra; P. Gajar disag; Tam. Carrot Kerrai; Tel. Gajjara akulu; Other name: Shikha mula.
7. Cauliflower greens: *Brassica oleracea* var. *botrytis*.
B. Phool-kopi sag; H., Mar. Phool gobee sag; Kan. Hukosina yele.
8. Colocasia leaves: *Colocasia anti-quorum*.
B. Kochu sag; H. Arvi-ka-sag; Kan. Shamangadde yele; Mal. Chembu ilagal; Mar. Alu pan; O. Sarue; Tam. Seppam ilaigal; Tel. Chama akulu; Other names: Guan-ka-sag; Alti; Kachu.
9. Coriander leaves: *Coriandrum sativum*.
B. Dhane sag; G. Kothmer; H. Hara dhania; Kan. Kothambari soppu; Kash. Daaniwal; Mal., Tam. Kothamalli; Mar. Kothimbir; O. Dhania; Tel. Kothimiri.
10. Curry leaves: *Murraya koenigii*.
B., O. Barsanga; G. Mitha Limbdo; H. Gandhela; Kan. Karibevu; Mal., Tam. Karivepilai; Mar. Kadhi limb; Tel. Karivepaku.
11. Drumstick leaves: *Moringa oleifera*.
B., O. Sajna sag; G. Saragavo; H. Saijan patta; Kan. Nuggeyele; Mal. Muringa ela; Mar. Shevaga Pan; Tam. Murungai keera; Tel. Mulaga akulu; Other names: Horse radish leaves, Suha najna.
12. Fenugreek leaves: *Trigonella foenum graecum*.
B., H., O. Methi sag; G., Kash., Mar. Methi; Kan. Menthya soppu; Mal. Uluva ila; Tam. Venthiya kerrai; Tel. Menthikoora; Other name: Methika.
13. Gogu: *Hibiscus cannibuns*.
B. Mestapat; G., Mar. Ambadi; H. Pitwa; Kan. Pundi; O. Nalite saga; Tam. Pulichai keera; Tel. Gongura; Other name: Nalita.
14. Knol-khol greens: *Brassica oleracea* var. *caulorapa*.
B. Col sag; H. Ganth gobi-ka-sag; Kash. Monjhak; P. Gadhgobee-da-sag.
15. Mint: *Mentha spicata*.
B., H., Kan., Mal., Mar., P., Tam., Tel. Pudina; G. Fudina; Kash. Pudynu; O. Podana patra.
16. Ponnanganni: *Alternanthera sessilis*.
B. Khanchari; H. Saranti sag; Kan. Honagone soppu; Mal., Tam., Ponnanganni; O. Madarang; Tel. Ponnaganti Koora; Other name: Khane hari.
17. Radish leaves: *Raphanus sativus*.
B., H., G., Mar. Mooli ka sag; Kash. Mujilak; Kan., Mal., Tam. Mullangi ilaigal; Tel. Mullangi akulu; Other name: Mulaka.
18. Spinach : *Spinacia oleracea*.
B., O. Palang sag; G., H., Kash., Mar., P. Palak; Kan. Spinak soppu; Mal. Basala cheera; Tam. Pasalai keera; Tel. Palakoora.

PORTION SIZES FOR MENU PLAN

Table - 1

Portion Size of Foods (raw) and Nutrients

Food Groups	g/Portion	Energy (Kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
Cereals & millets	30	100	3.0	20	0.8
Pulses	30	100	6.0	15	0.7
Egg	50	85	7.0	-	7.0
Meat/chicken/fish	50	100	9.0	-	7.0
Milk (ml) [®]	100	70	3.0	5	3.0
Roots & Tubers	100	80	1.3	18	-
Green leafy vegetables	100	45	3.6	-	0.4
Other vegetables	100	30	1.7	-	0.2
Fruits	100	40	-	10	-
Sugar	5	20	-	5	-
Fats & Oils (visible)	5	45	-	-	5.0

The balanced diets are given as multiples of these portion sizes

[®] Toned milk.

Table - 2

**Balanced Diet for Infants, Children and Adolescents
(Number of Portions)**

Food groups	g/portion	Infants 6-12 months	Years						
			1 - 3	4 - 6	7 - 9	10 - 12		13 - 18	
						Girls	Boys	Girls	Boys
Cereals & millets	30	1.5	4	7	9	9	11	10	14
Pulses	30	0.5	1	1.5	2	2	2	2	2
Milk (ml)	100	5 ^a	5	5	5	5	5	5	5
Roots & tubers	100	0.5	0.5	1	1	1	1	1	2
Green leafy vegetables	100	0.25	0.5	0.5	1	1	1	1	1
Other vegetables	100	0.25	0.5	0.5	1	1	1	1	1
Fruits	100	1	1	1	1	1	1	1	1
Sugar	5	5	5	6	6	6	7	6	7
Fats/oils (visible)	5	2	4	5	5	5	5	5	5

^a Quantity indicates top milk. For breastfed infants, 200 ml top milk is required.

One portion of pulse may be exchanged with one portion (50 g) of egg/meat/chicken/fish.

For infants introduce egg/meat/chicken/fish around 9 months.

Specific recommendations as compared to a sedentary woman :

Children :

1-6 years - 1/2 to 3/4 the amount of cereals, pulses and vegetables and extra cup of milk.

7-12 years - Extra cup of milk

Adolescent girls - Extra cup of milk

Adolescent boys - Diet of sedentary man with extra cup of milk

Table - 3

**Balanced Diet for Adults - Sedentary/Moderate/Heavy Activity
(Number of portions)**

Food Groups	g/portion	Type of work					
		Sedentary		Moderate		Heavy	
		Man	Woman	Man	Woman	Man	Woman
Cereals & millets	30	14	10	16	12	23	16
Pulses	30	2	2	3	2.5	3	3
Milk	100 ml	3	3	3	3	3	3
Roots & tubers	100	2	1	2	1	2	2
Green leafy vegetables	100	1	1	1	1	1	1
Other vegetables	100	1	1	1	1	1	1
Fruits	100	1	1	1	1	1	1
Sugar	5	5	4	8	5	11	9
Fats and Oils (visible)	5	4	4	7	6	11	8

For non-vegetarians substitute one pulse portion with one portion of egg/meat/chicken/fish.

Table - 4

SAMPLE MEAL PLAN FOR ADULT MAN (SEDENTARY)

Meal Time	Food Group	Raw Amounts	Cooked Recipe	Servings
Breakfast	Milk	100 ml	Milk or	1/2 Cup
	Sugar	15 g	Tea or	2 Cups
			Coffee	1 Cup
	Cereals	70 g	Breakfast Item	
	Pulses	20 g		
Lunch	Cereals	150 g	Rice	2 Cups
			Pulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	150 g	Veg. curry	3/4 Cup
	Vegetables	50 g	Veg. salad	7-8 Slices
	Milk	100 ml	Curd	1/2 Cup
Tea	Cereals	50 g	Snack	
	Milk	50 ml	Tea	1 Cup
	Sugar	10 g		
Dinner	Cereals	150 g	Rice	2 Cups
			Pulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	150 g	Veg. curry	3/4 Cup
	Milk (Curd)	50 ml		
	Vegetables	50 g	Veg. raita	1/2 Cup
	Fruit	100 g	Seasonal	1 Medium

1 Cup = 200 ml

Note: For Non-Vegetarians - Substitute one pulse portion with one portion of egg/meat/chicken/fish

Use 20 g visible fat per day.

Breakfast Items: Idli - 4 Nos. / Dosa - 3 Nos. / Upma - 1-1/2 Cup / Bread - 4 Slices/
Porridge - 2 Cups / Corn flakes with milk - 2 Cups.

Snacks : Poha - 1 Cup / Toast - 2 Slices / Samosa - 2 / Sandwiches-2 /
Biscuits - 5.

Table - 5

SAMPLE MEAL PLAN FOR ADULT WOMAN (SEDENTARY)

Meal Time	Food Group	Raw Amounts	Cooked Recipe	Servings
Breakfast	Milk	100 ml	Milk or	1/2 Cup
	Sugar	10 g	Tea or	2 Cups
			Coffee	1 Cup
	Cereals	50 g	Breakfast Item.	
	Pulses	20 g		
Lunch	Cereals	100 g	Rice	1 Cup
			Pulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	100 g	Veg. curry	1/2 Cup
	Vegetables	50 g	Veg. salad	7-8 Slices
	Milk	100 ml	Curd	1/2 Cup
Tea	Cereals	50 g	Snack	
	Milk	50 ml	Tea	1 Cup
	Sugar	10 g		
Dinner	Cereals	100 g	Rice	1 Cup
			Pulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	100 g	Veg. curry	1/2 Cup
	Milk (Curd)	50 ml	Veg. raita	1/2 Cup
	Vegetables	50 g		
	Fruit	100 g	Seasonal	1 Medium

1 Cup = 200 ml

Note: For Non-Vegetarians - Substitute one pulse portion with one portion of egg/meat/chicken/fish

Use 20 g visible fat per day.

Breakfast Items: Idli - 3 Nos. / Dosa - 2 Nos. / Upma - 1 Cup / Bread - 3 Slices / Porridge - 1-1/2 Cups / Corn flakes with milk - 1-1/2 Cup.

Snacks : Poha - 1 Cup / Toast - 2 Slices / Samosa - 2 / Sandwiches-2 / Biscuits - 5.

Table - 6

Approximate Calorific Value of Some Cooked Preparations

Preparation	Quantity for one serving	Calories (Kcal)
1. Cereal		
Rice	1 cup	170
Phulka	1 No.	80
Paratha	1 No.	150
Puri	1 No.	100
Bread	2 slices	170
Poha	1 cup	270
Upma	1 cup	270
Idli	2 Nos.	150
Dosa	1 No.	125
Kichidi	1 cup	200
Wheat porridge	1 cup	220
Semolina porridge	1 cup	220
Cereal flakes with milk (corn/wheat/rice)	1 cup	220
2. Pulse		
Plain dhal	1/2 cup	100
Sambar	1 cup	110
3. Vegetable		
With gravy	1 cup	170
Dry	1 cup	150
4. Non-Vegetarian		
Boiled egg	1 No.	90
Omelette	1 No.	160
Fried egg	1 No.	160
Mutton curry	3/4 cup	260
Chicken curry	3/4 cup	240
Fish fried	2 big pieces	220
Fish cutlet	2 Nos.	190
Prawn curry	3/4 cup	220
Keema kofta curry (6 small koftas)	3/4 cup	240

Preparation	Quantity for one serving	Calories (Kcal)
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5. Savoury snacks

Bajji or pakora	8 Nos.	280
Besan ka pura	1 No.	220
Chat (Dahi-pakori)	5 pieces	220
Cheese balls	2 Nos.	250
Dahi vada	2 Nos.	180
Vada	2 Nos.	140
Masala vada	2 Nos.	150
Masala dosa	1 No.	200
Pea-kachori	2 Nos.	380
Potato bonda	2 Nos.	200
Sago vada	2 Nos.	210
Samosa	1 No.	200
Sandwiches (butter - 2 tsp)	2 Nos.	200
Vegetable puff	1 No.	170
Pizza (Cheese and tomato)	1 slice	200

6. Chutneys

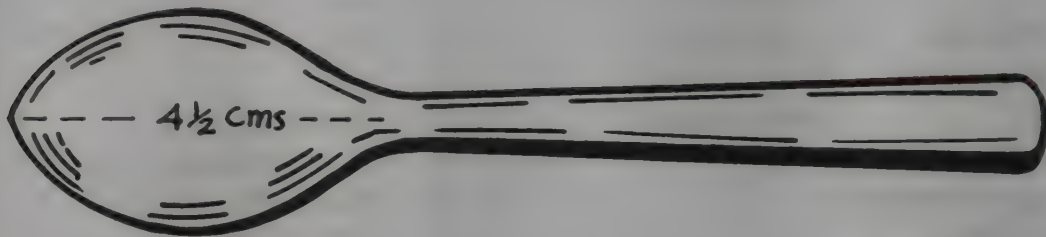
Coconut/groundnut/til	2 tbsp	120
Tomato	1 tbsp	10
Tamarind (with jaggery)	1 tbsp	60

7. Sweets and Desserts

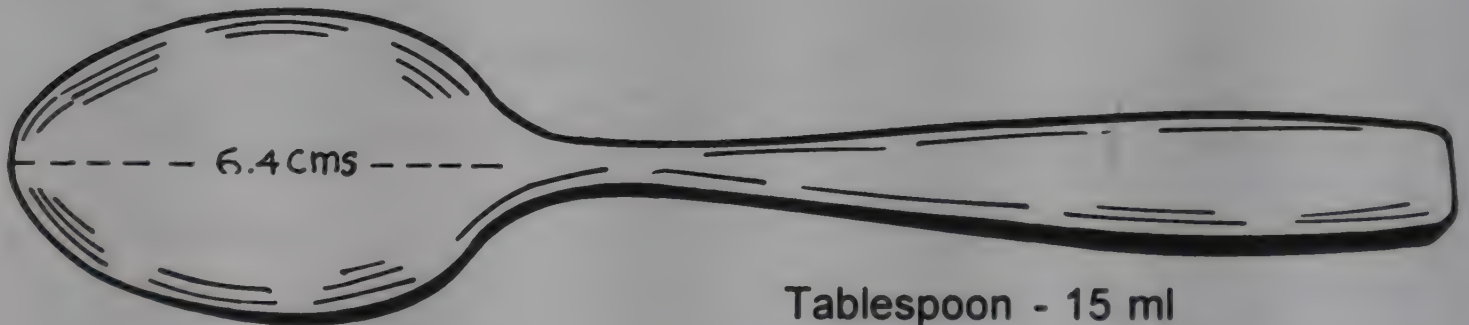
Besan barfi	2 pieces	400
Chikki	2 pieces	290
Fruit cake	1 piece	270
Rice puttu	1/2 cup	280
Sandesh	2 Nos.	140
Double ka meetha	1/2 cup	280
Halwa (kesari)	1/2 cup	320
Jelly/Jam	1 tsp	20
Custard (caramel)	1/2 cup	160
Srikhand	1/2 cup	380
Milk chocolate	25 g	140
Ice-cream	1/2 cup	200

Preparation		Quantity for one serving		Calories (Kcal)
8. Beverages				
Tea	(2 tsp sugar + 50 ml toned milk)	1	cup	75
Coffee	(2 tsp sugar + 100 ml toned milk)	1	cup	110
Cow's milk	(2 tsp sugar)	1	cup	180
Buffalo's milk	(2 tsp sugar)	1	cup	320
Lassi	(2 tsp sugar)	1	glass (200 ml)	110
Squash		1	glass (200 ml)	75
Syrups (Sherbat)		1	glass (200 ml)	200
Cold drinks		1	bottle (200 ml)	150
Fresh lime juice		1	glass (200 ml)	60

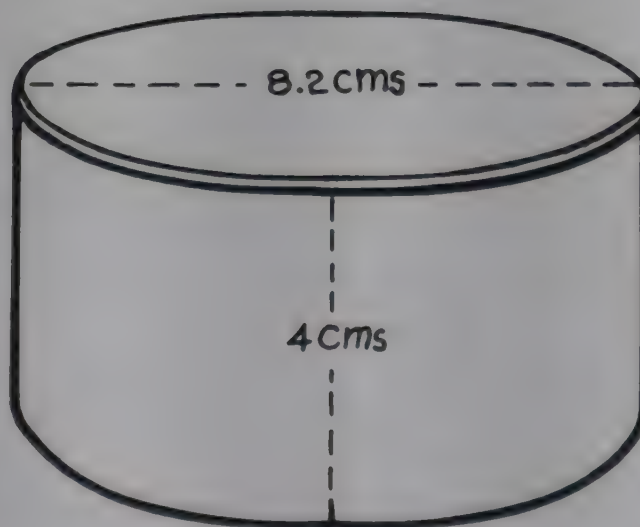
SIZE OF TEASPOON, TABLESPOON AND CUP



Teaspoon - 5 ml



Tablespoon - 15 ml



Cup 200 ml

Table - 7

Approximate Calorific Value of Nuts, Salads and Fruits

	Serving	Calories
Nuts		
Almonds	10 Nos.	85
Cashewnuts	10 Nos.	95
Coconut (fresh)	$\frac{1}{4}$	130
Coconut (dry)	$\frac{1}{4}$	140
Peanuts	50 Nos.	90
Fresh fruits		
Apple	1 medium	65
Banana	1 medium	90
Grapes	30 Nos.	70
Guava	1 medium	50
Jackfruit	4 pieces	90
Mango	1 medium	180
Mosambi/orange	1 medium	40
Papaya	1 piece	80
Pineapple	1 piece	50
Sapota	1 medium	80
Custard apple	1 medium	130
Watermelon/muskmelon	1 slice	15
Salads		
Beetroot	1 medium	30
Carrot	1 medium	20
Cucumber	1 medium	15
Onion	1 medium	25
Radish	1 medium	10
Tomato	1 medium	10

EXERCISE AND PHYSICAL ACTIVITY

Individuals over the age of 20 years should undertake a minimum of 30 minutes of physical activity of moderate intensity (such as brisk walking 5-6 km/hr) on most, if not all, days of the week. Greater health benefits can be obtained by engaging in physical activity of longer duration or more vigorous intensity (such as jogging, running, cycling and swimming).

Sedentary people embarking on a physical activity programme should undertake a moderate intensity activity of short duration to start with and gradually increase the duration or intensity. Other day-to-day activities like walking, housework, gardening, will be beneficial not only in weight reduction but also for lowering of blood pressure and serum triglycerides. This also elevates HDL (good) cholesterol in blood. Simple modification in lifestyle like deliberately climbing up the stairs instead of using the lift and walking for short distance instead of using a vehicle could also immensely help in increasing our physical activity.

Exercise programme should include 'warm up' and 'cool down' periods each lasting for 5 minutes. During exercise, the intensity of exercise should ensure 60-70% increase in heart rate.

Previously inactive men over the age of 40 years, women over the age of 50 years and people at high risk for chronic diseases like heart disease and diabetes should first consult a physician before engaging in a programme of vigorous physical activity such as running and swimming.

*ENERGY EXPENDITURE ON VARIOUS PHYSICAL ACTIVITIES (Kcal/hr)

Activity	Kcal/hr	Activity	Kcal/hr
Cleaning/Mopping	210	Shuttle	348
Gardening	300	Table Tennis	245
Watching TV	86	Tennis	392
Cycling		Volley Ball	180
15 (Km/hr)	360	Dancing	372
Running		Fishing	222
12 (Km/hr)	750	Shopping	204
10 (Km/hr)	655	Typing	108
8 (Km/hr)	522	Sleeping	57
6 (Km/hr)	353	Standing	132
Walking 4 (Km/hr)	160	Sitting	86

* Approx. energy expenditure for 60 Kg reference man. Individuals with higher body weight will be spending more calories than those with lower body weight. Reference woman (50 kg) will be spending 5% less calories.

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GLOSSARY

Allergic reaction : Immunologically induced tissue response to a foreign substance (allergen).

Alpha-linolenic acid : 18 carbon fatty acid with three double bonds; the first double bond is on the third carbon atom from the methyl end and therefore it is called n-3 fatty acid. It is abbreviated as 18: 3 n-3.

Amino acid : The fundamental building block of proteins.

Anabolism : Process by which complex materials in tissues and organs are built up from simple substances.

Antioxidants : A group of substances that prevent the damage caused by the oxidation of fatty acids and proteins by oxygen free radicals.

Atherosclerosis : Gradual deposition of fatty materials and fibrous tissues in the inner lining of the arteries with eventual obstruction of blood flow.

Balanced Diet : A diet containing all essential (macro and micro) nutrients in optimum quantities and in appropriate proportions that meet the requirements.

Beta-Carotene : A yellow - orange plant pigment which yields vitamin A by oxidation in the body.

Bifidus factor : A substance in human milk which stimulates the growth of a micro-organism (*Lactobacillus bifidus*) in the infants' intestine.

Body Mass Index : Body weight in relation to height. Body weight in kilograms divided by height in metres².

Calorie : Unit used to indicate the energy value of foods. Quantitative requirements are expressed in terms of energy, i.e., kilocalories (Kcals). Newer unit for energy is Kjoules.

Catabolism : Process of breakdown of complex organic constituents in the body.

Cataract : An opacity of the lens of the eye resulting in impaired vision.

Cholesterol : A lipid constituent of blood and tissues derived from diet as well as from synthesis within the body.

Cirrhosis : Inflammation and scarring of liver tissues resulting in impaired liver function.

Colostrum : The milk produced by mammals during the first few days after delivery.

Congenital anomalies : Deformities existing at birth or even before.

Coronary heart disease : A disease of the heart due to inadequate blood supply as a result of narrowing/obstruction of coronary arteries which nourish heart muscle.

CU : Consumption Unit. One unit represents Recommended Dietary Allowance of energy for a sedentary man.

Diabetes mellitus : A disease in which the blood glucose is increased and the body tissues cannot use glucose properly.

Diverticular disease : The presence of many pouches or sac-like protrusions on the wall of the intestine.

Empty calories : Term used for foods that provide only energy without any other nutrient, eg. white sugar and alcohol.

Enzymes : Biological catalysts which enhance the rate of chemical reactions in the body.

Essential fatty acids (EFA) : Fatty acids like linoleic acid and alpha linolenic acid which are not made in the human body and must be supplied through the diet.

Fatty acids : Fundamental constituents of many lipids.

Fibre : Collective term for the structural parts of plant tissues which are resistant to the human digestive enzymes.

Flavonoids : Pigments widely distributed in nature in flowers, fruits and vegetables.

Food Exchange : Foods are classified into different groups for exchange. Each "exchange list" includes a number of measured foods of similar nutritive value that can be substituted inter-changeably in meal plans.

Free radicals : Highly reactive oxygen-derived species formed in the body during normal metabolic processes. They have the capacity to damage cellular components by oxidation.

Haemorrhoids : Commonly known as piles.

High-density lipoproteins (HDL) : These transport cholesterol from the extra-hepatic tissues to the liver. They are anti-atherogenic.

Hormones : Substances produced by a gland (endocrine) which are secreted directly into the blood stream to produce a specific effect on another organ.

Hyperlipidemia : An increase in the concentration of blood lipids (triglycerides and cholesterol).

Invisible fats : Fat present as an integral component of plant and animal foods such as in cereals, legumes and spices.

Ischaemia : Lack of blood supply to an organ or tissue resulting in reduced oxygen supply, caused either by constriction or obstruction of the blood vessel.

Lactoferrin : Minor protein of milk containing iron.

Lactose intolerance : Disorder resulting from improper digestion of milk sugar called lactose, due to lack of an enzyme, lactase, in the intestinal mucosa.

Linoleic acid : Fatty acid containing 18 carbon atoms and two double bonds. The first double bond is on the sixth carbon atom from the methyl end. Therefore it is called n-6 fatty acid and is abbreviated as 18:2 n-6.

Lipids : A technical term for fats. They are important dietary constituents. The group includes triglycerides, steroids, cholesterol and other complex lipids.

Lipoproteins : Lipids are not soluble in blood; they are therefore transported as lipid and protein complexes.

Low-density lipoproteins (LDL) : These transport cholesterol from the liver to tissues. High blood levels indicate that more cholesterol is being transported to tissues.

Macrocytic anaemia : Anaemia characterized by red blood cells which are larger than normal.

Macronutrients : Nutrients like carbohydrates, proteins and fats which are required in large quantities .

Metabolism : Includes catabolism and anabolism.

Microcytic anaemia : Anaemia characterized by red blood cells which are smaller than normal.

Micronutrients : Nutrients which are required in small quantities, such as vitamins and trace elements.

Monounsaturated fatty acids : Unsaturated fatty acids with one double bond.

n-6 PUFA : Linoleic acid and its longer chain polyunsaturated fatty acids are collectively called n-6 PUFA.

n-3 PUFA : Alpha-linolenic acid and its longer-chain polyunsaturated fatty acids are collectively called n-3 PUFA.

Osteoporosis : A condition of abnormal porousness or thinning of bones.

Phytochemicals : General name for chemicals present in plants.

Polyunsaturated fatty acids (PUFA) : Unsaturated fatty acids with two or more double bonds.

Processed foods : Foods that are produced by converting raw food materials into a form suitable for eating.

Pre-eclampsia: A toxemic condition of late pregnancy characterized by increased blood pressure, swelling of feet and excretion of protein in the urine.

Protein Energy Malnutrition (PEM) : A marked dietary deficiency of both energy and protein resulting in undernutrition.

Recommended Dietary Allowances (RDA) : The amounts of dietary energy and nutrients considered sufficient for maintaining good health by the people of a country.

Refined foods : Foods which have been processed to improve their appearance, colour, taste, odour or keeping quality.

Saturated fatty acids : Fatty acids containing maximum number of hydrogen atoms that each carbon atom can carry. They do not have double bonds.

Satiety : Feeling of satisfaction after food intake.

Stroke : Popular term for cerebro-vascular disease, a sudden condition that arises from blocking or bleeding of blood vessels in the brain, resulting in paralysis.

Thrombosis : The condition in which the blood changes from a liquid to a semi-solid state and produces a blood clot (thrombus) which blocks blood flow.

Trans-fatty acids : Are mainly produced during hydrogenation of oils; a few also occur naturally in very small quantities.

Triglycerides (Neutral fat) : The major type of dietary fat and the principal form in which energy is stored in the body. A complex of fatty acids and glycerol.

Unsaturated fatty acids : Fatty acids in which there is a shortage of hydrogen atoms. The carbon atoms then become linked by double bonds. Unsaturated fatty acids are less stable than saturated fatty acids.

Visible fats : Fats and oils that can be used directly or in cooking.

Weaning foods : Foods which are used during gradual transition of the infant from breast-feeding to a normal diet.

